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# CARRIAGE IRONWORK,

—: BY :—

W M. N. FITZ-GERALD.

1397



THE  
BLACKSMITHS' HAND BOOK,  
IRON WORK

—: O F :—

Carriages Tabulated,

AND

*USEFUL INSTRUCTIONS,*

—: B Y :—

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— · · · —  
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## GENERAL NOTICE REGARDING THE IRON IN THE TABLES.

The kinds of metals selected are those possessing the best qualities and best adapted to each part. These grades may not always be accessible; when this is the case select a brand that approximates nearest to the one specified; in place of Low Moor for piece part to axle beds use L. W. or Burden's. Norway is the most tenacious and malleable iron used by carriage makers, and should always be kept in stock. Where Norway is recommended, and it cannot be had, substitute Ulster, but do not substitute Norway for Ulster, as it is not stiff enough; Burden's or Low Moor should be used instead. Let Norway, Low Moor, Ulster and Burden's be the standard, always selecting the brands that are nearest possessing their peculiar qualities when these are not available.

Where lengths and widths are omitted, these are dependent upon the size of the frame or other portion to which the irons are attached.

# No. 1.

**Table of Kinds and Sizes of Iron Used in Constructing a 125 Pound Road Wagon on Half Springs.**

Sectional Parts.	Metal.	Shape.	Size.
Axles, nut.....	Steel.....	Straight.....	5 $\frac{1}{8}$ x 6 inches.
Piece part, front.....	Burden's iron.....		1 $\frac{1}{2}$ x 1 $\frac{1}{2}$ inch.
Piece part, back.....	Burden's iron.....		1 $\frac{5}{8}$ x 1 inch.
Beds, full length.....			3 feet 4 inches.
Springs.....	Length from center of bar bearings.....	Swedes steel, oil temper. Half elliptic, 2 plates.	1 $\frac{1}{8}$ inches.
Plates.....	Norway iron.....	Half circle.....	21 inches. No. 5.
Fifth wheel.....		9 inches.	
Plates.....		Half round.....	1 $\frac{1}{2}$ inch.
Bolts.....	Norway iron.....	Flat.....	5 $\frac{1}{8}$ x 5 inches.
Head plates.....	Norway iron.....	Flat.....	5 $\frac{1}{8}$ x 5 inches.
Bolts.....	Norway iron.....	Swaged.....	5 $\frac{1}{8}$ x 5 inches.
Shaft irons.....	Burden's iron.....		6 inches.
Length front of bar.....			5 inches.
Length on bar.....			1 $\frac{1}{4}$ inch.
Bolts.....	Norway iron.....	Round heads.....	No. 1.
Jack clips.....	Norway iron.....	Saunders.....	
Clip part.....		Flat.....	5 $\frac{1}{8}$ inch.
Bolt part.....		Round.....	5 $\frac{1}{8}$ inch.
Axle, heel part.....		Flat.....	1 inch.
Perch plates.....	Norway iron.....	Flat.....	5 $\frac{1}{8}$ x 5 inches.
Heel clips, length bottom.....	Norway iron.....	Flat.....	10 inches.
Heel clips, length top.....	Norway iron.....	Flat.....	6 inches.
Bolts.....	Norway iron.....		5 $\frac{1}{8}$ inch.
Side stays.....	Burden's iron.....	Oval.....	5 $\frac{1}{8}$ x 5 inches.
Ends.....	Norway iron.....		
Bolts, front.....	Norway iron.....	Square heads.....	1 $\frac{1}{2}$ inch.
Bolts at butts.....	Norway iron.....	Square heads.....	5 $\frac{1}{8}$ inch.
Clip king bolt.....	Norway iron.....	Strap.....	5 $\frac{1}{8}$ inch.
Bolt part.....			5 $\frac{1}{8}$ inch.
Tire.....	Steel.....		5 $\frac{1}{8}$ x 3-32 inch.
Bolts at joints.....	Norway iron.....		1 $\frac{1}{2}$ inch.
Screws.....			5 $\frac{1}{8}$ No. 8.
Step pads.....	Norway iron.....	Square.....	3 x 3 $\frac{1}{4}$ inches.
Shanks.....	Ulster iron.....	Oval.....	7 $\frac{1}{8}$ x 5 $\frac{1}{16}$ inch.
Back stays.....	Ulster iron.....	Round.....	3 $\frac{1}{8}$ inch.
Bolts.....	Norway iron.....		1 $\frac{1}{2}$ inch.
Dash, height.....			10 inches.
Main and bottom bars.....		Oval.....	1 $\frac{1}{2}$ x 1 $\frac{1}{4}$ inches.
Other bars.....		Oval.....	3 $\frac{1}{8}$ x 1 $\frac{1}{4}$ inch.
Heels.....	Norway iron.....		1 $\frac{1}{4}$ x 3 $\frac{1}{4}$ inch.
Foot rod.....	Ulster iron.....	Oval.....	1 $\frac{1}{2}$ x 5 $\frac{1}{16}$ inch.
Seat stays.....	Ulster iron.....	Oval.....	3 $\frac{1}{8}$ x 5 $\frac{1}{16}$ inch.
Wear iron, length.....	Steel.....	Flat.....	4 $\frac{1}{2}$ inches.

## THE BLACKSMITH.

The artist who pictures a blacksmith, portrays a brawny fellow, with huge hands and muscles of an athlete, thus conveying the idea that his occupation is one that depends almost entirely upon physical force. Longfellow says:

"The smith, a mighty man is he,  
With large and sinewy hands;  
And the muscles of his brawny arms  
Are strong as iron bands."

Physically he should be all this, but if his mental is not equal to his physical power he is not a true representative of his craft, it requires something more than brute force to mold the iron to its proper shape. A knowledge of the characteristics of the metal used, great perception, prompt action and absolute precision are necessary, he must "strike while the iron is hot" every blow must be in the right place, he has no time to stop and ponder over the best course to pursue, a minute wasted loses a heat, he must think and strike at the same time; each blow must do its part and be given with a force in keeping with the condition of his heat. Then, too, he must have a practiced eye for curves. With a carriage blacksmith there are few sweeps that can be made to a pattern, and the more thorough the training of the eye and hand the more perfect the work. With young men learning the trade there is too little thought given to drawing, they cannot understand how the knowledge of free hand or mechanical drawing can aid them, but as they become more and more skilled, they appreciate more fully the want of that knowledge. A thorough understanding of free hand drawing imparts confidence and aids to cultivate one great requisite, for promptness, besides cultivating correct taste. The blacksmith that can place a correct free-hand-drawing on a draft board can with equal accuracy shape his irons to a true sweep.

He should be able to make a complete working drawing of the carriage or gear and all of its individual parts. The working drawing that governs the body maker, should be equally clear to the blacksmith, and if he is competent to design and place upon the black-board a carriage complete from every point of view, the labor of making it will be materially decreased. "Think between heats" should be the motto and habit of every man who works at the forge.

## No. 2.

Sectional Parts.	Metal.	Shape.	Size.
Axles, mnt.	Steel.	Plain taper.	$7\frac{1}{2} \times 6\frac{1}{2}$ inches.
Piece part, front.	B. B. iron		$11\frac{1}{2} \times 7\frac{1}{8}$ inch.
Piece part, back.	Low Moor iron		$11\frac{1}{2} \times 8\frac{1}{4}$ inch.
Springs, three plates			$1\frac{1}{4}$ inch.
Length			32 inches.
Back, open	Best Swedes steel.	Full elliptic button	8 inches.
Front, open		heads, round ends.	7 inches.
Main plates			No. 4.
Other plates			No. 5.
Springs for side bars		Half elliptic.	$1\frac{1}{8}$ inches.
Length from center of bearings			25 inches.
Two plates			(No. 5.
Fifth wheel	Norway iron	Half circle.	12 inches.
Plates		Half round.	$7\frac{1}{2}$ inch.
Bolts			$1\frac{1}{8}$ inch.
Head plates	Norway iron		$3\frac{1}{4} \times 4$ inch.
Bolts			$\frac{1}{4}$ inch.
Shaft irons	Burden's iron		$11\frac{1}{2} \times 1\frac{1}{16}$ inch.
Length of front bar			8 inches.
Length on bar			6 inches.
Bolts	Norway iron	Flat heads	$1\frac{1}{4}$ inch.
Jack clips	Norway iron		1 inch.
Heel part			$1\frac{1}{8}$ inch.
Bolt part			$\frac{1}{2}$ inch.
Perch plates, ends	Norway iron	Flat	$3\frac{1}{4} \times 4$ inch.
Center	Burden's iron		$3\frac{1}{4} \times 4$ inch.
Heel clips, bottom	Norway iron		10 inches long.
Heel clips, top			6 inches long.
Bolts			$\frac{1}{4}$ inch.
Side stays	Norway iron	Oval	$2\frac{1}{2} \times 5\frac{1}{8}$ inch.
Ends	B. B. iron		$3\frac{1}{8} \times 5\frac{1}{8}$ inch.
Bolts, front	Norway iron	Square	$3\frac{1}{8} \times 5\frac{1}{8}$ inch.
Bolts, at butts	Norway iron	Round heads	$1\frac{1}{8}$ inch.
Spring bar bolts	Norway iron		$1\frac{1}{4}$ inch.
Clip king bolt	Norway iron		$1\frac{1}{4}$ inch.
Bolt part			$\frac{1}{2}$ inch.
Body loops	B. B. iron	Swaged	$1\frac{1}{2} \times 2$ inch.
At heads			$3\frac{1}{4} \times \frac{5}{8}$ inch.
Head		Round	$7\frac{1}{2} \times 7\frac{1}{8}$ inch.
Strap on bottom	Band iron		$1\frac{1}{2} \times 1$ inch.
Bolts for heads	Norway iron	Cone heads	$1\frac{1}{8}$ inch.
Bolts for corners	Norway iron	Flat heads	$\frac{1}{2}$ inch.
Cross spring	Steel	Timken	No. 2.
Tire	Steel		$\frac{7}{8}$ inch.
Bolts at joints	Norway iron	Tire	$\frac{1}{2}$ inch.
Screws			$5\frac{1}{8}$ inch No. 8.
Step pads	Norway iron	Square	$3 \times 3\frac{1}{2}$ inch.
Branches	B. B. iron	Oval	$7\frac{1}{2} \times 1\frac{1}{16}$ inch.
Bolts	Norway iron		$\frac{1}{2}$ inch.
Dash, light			13 inches.
Main and bottom bars	Low Moor iron	Oval	$1\frac{1}{2} \times 4$ inch.
Other bars	Low Moor iron	Oval	$3\frac{1}{8} \times 1\frac{1}{4}$ inch.
Heels	Norway iron		$1\frac{1}{4} \times 3\frac{1}{4}$ inch.
Foot rod	B. B. iron	Half oval	$\frac{5}{8}$ inch.
Seat stay	Burden's iron	Oval	$3\frac{1}{8} \times 1\frac{1}{8}$ inch.
Wear iron	Steel		4 $\frac{3}{4}$ inches long.
Shifting rail	Norway iron	Oval	$1\frac{1}{2} \times 1\frac{1}{8}$ inch.
Side and back stays	Norway iron	Rond	$\frac{5}{8}$ inch.
Stump joints, long	Norway iron		$5\frac{1}{8}$ inch.
Piece part	Burden's iron	Oval	$5\frac{1}{8} \times 1\frac{1}{16}$ inch.
Short	Norway iron		$\frac{1}{2}$ inch.
Piece part	Burden's iron	Oval	$1\frac{1}{2} \times 1\frac{1}{8}$ inch.
Seat handles		Round	$\frac{3}{4}$ inch.

### BLACKSMITH COAL.

There are three kinds of coal that can be used in the blacksmith shop—anthracite, bituminous and charcoal. The latter is superior to the other kinds, as regards its effect upon the metals, but it is the most expensive of any, besides requiring more time to produce fusion, and is otherwise objectionable because of the bulk necessary to keep the fire up to the required heat. Anthracite coal, being hard and coarse, does not lie sufficiently close to give a good, even fire; the softer qualities, such as the Lackawanna, have been used with some success, but it lacked one quality which is an almost indispensable one in the blacksmith's fire—that of incrustation, without which much of the heat is lost. Bituminous coal is without doubt the most desirable of all; its minute particles admit of almost instant adhesion, and when heat up to 300 or 400 degrees Fahrenheit, a crust forms which retains the gases until they are burnt, leaving a body of coke upon which the fire can feed.

All bituminous coals, however, are not adapted to the forge; the cannel and gas coals contain too much volatile matter and are therefore almost useless. The best coal in this country, if not in the world, is undoubtedly in Cumberland; it possesses in a wonderful degree all the desirable qualities, and is remarkably free from extraneous matter.

# No. 3.

**Table of Kinds and Sizes of Iron Used in Ironing a Top Buggy, Weight about 300 Pounds, Track 4 feet 8 Inches.**

<i>Sectional Parts.</i>	<i>Metal.</i>	<i>Shape.</i>	<i>Size.</i>
Axes, nut.	Steel.	Plain taper	$7\frac{1}{2} \times 6\frac{1}{2}$ inches.
Piece part.	Low Moor iron.	Bar	$3\frac{1}{2} \times 1\frac{1}{2}$ inches.
Length.			3 feet 8 inches.
Springs, three plates.			$1\frac{1}{4}$ inches.
Front, length.			32 inches.
Open.			8 inches.
Main and second plates.	Swedes steel.	Elliptic spear point top plates, square ends on bottom plates, button heads.	No. 4.
Additional plates.			No. 5.
Back, length.			32 inches.
Open.			$8\frac{1}{2}$ inches.
Main plate.			No. 3.
Additional plates.			No. 4.
Fifth wheel.	Norway iron.		12 inches.
Fifth wheel at bearings.			$7\frac{1}{2}$ inch.
Shaft from heads.	Burden's iron.		$1\frac{1}{4}$ inches.
Bolts.	Norway iron.	Square heads	$\frac{7}{16}$ inch.
Ears of jack clips.	Norway iron.		$\frac{7}{16}$ inch.
Shaft irons.	Burden's iron.	Flat oval	$1\frac{1}{4} \times \frac{1}{2}$ inch.
Bolts.	Norway iron.	Steeple heads	$\frac{1}{4}$ inch.
Jack clips.	Norway iron.	Flat	.1 inch.
Screw ends.	Norway iron.	Round	$\frac{5}{16}$ inch.
Additional clips.	Norway iron.	Flat	.8 inch.
Screw ends.	Norway iron.	Round	$\frac{1}{4}$ inch.
Perch plate ends.	Norway iron.	Bar	$3\frac{1}{4} \times \frac{1}{4}$ inch.
Center.	Ulster iron.	Flat	$3\frac{1}{4} \times \frac{7}{16}$ inch.
Bolts.	Norway iron.	Steeple heads	$\frac{1}{6}$ inch.
Side stays.			
Ends at heels.	Low Moor iron.	Oval	$1\frac{1}{4} \times \frac{1}{2}$ inch.
Head block bolt.	Norway iron.	Square	$1\frac{1}{4} \times 1\frac{1}{2}$ inches.
Bolts at stay branch.	Norway iron.	Turned heads	$\frac{1}{6}$ inch.
Bolts for front ends.	Norway iron.	Turned heads	$\frac{1}{6}$ inch.
Spring and spring bar clips.	Norway iron.	Flat	$\frac{5}{8}$ inch.
Ends.	Norway iron.	Round	$\frac{1}{6}$ inch.
Clip king bolt at head plate.	Norway iron.	Round	$\frac{1}{6}$ inch.
Spring section.	Norway iron.	Round	$\frac{3}{8}$ inch.
Body loops.	Burden's iron.	Oval	$1\frac{1}{2} \times \frac{1}{2}$ inch.
At head.		Oval	$3\frac{1}{4} \times \frac{3}{8}$ inch.
Head.		Round	$7\frac{1}{2} \times \frac{7}{8}$ inch.
Center piece.	Best strap iron.	Flat	$\frac{1}{4} \times 1$ inch.
Bolts for heads.	Norway iron.	Steeple heads	$\frac{5}{16}$ inch.
Bolts at butts.	Norway iron.	Turned heads	$\frac{1}{4}$ inch.
Screw for center piece.			1 inch No. 12.
Tire.	Steel.	Flat	$7\frac{1}{2} \times \frac{1}{8}$ inch.
Bolts.	Norway iron.	Tire	$\frac{3}{16}$ inch.
Step pads, main.	Norway iron.	Tire jagged	$3\frac{1}{4} \times 3\frac{1}{2}$ inches.
Shank.	Burden's iron.	Oval	$3\frac{1}{8} \times \frac{5}{8}$ inch.
Pads, top.	Norway iron.	Flat jagged	$3 \times 3\frac{1}{4}$ inches.
Shank.	Burden's iron.	Oval	$3\frac{1}{8} \times \frac{5}{8}$ inch.
Dash, height.			10 inches.
Main and bottom bars.	Low Moor iron.	Oval	$1\frac{1}{2} \times \frac{5}{8}$ inch.
Top and center bars.	Low Moor iron.	Oval	$1\frac{1}{2} \times 1\frac{1}{4}$ inch.
Foot rod.	Burden's iron.	Oval	$5\frac{1}{8} \times \frac{3}{8}$ inch.
Stump joints, bottom prop.	Low Moor iron.		$1\frac{1}{2} \times \frac{5}{8}$ inch.
Piece part.	Norway iron.	Oval	$3\frac{1}{8} \times \frac{5}{8}$ inch.
Front prop.	Low Moor iron.	Oval	$3\frac{1}{8} \times 1\frac{1}{2}$ inch.
Piece part.	Norway iron.	Central Park	$2\frac{1}{2} \times \frac{1}{8}$ inch.
Hub bands.	Norway iron.		
Felloe plates.	Norway iron.		
Slat irons, four-bow.	Norway iron.	New York pattern	
Shifting rail.	Norway iron.	Round	$\frac{3}{8}$ and $1\frac{1}{2}$ inch.

## FILES.

The file comes next to the hammer in importance in the blacksmith shop, and how to use it so as to secure the greatest wear and the most work is an important pecuniary consideration. Manufacturers in too many cases do not view this subject in a proper light. Some adopt the rule to give out new files at stated intervals, while others refuse them so long as those in use can be made to cut. Neither custom is to be commended. A skillful man will perform much more work than an unskillful one in a given period. One man may be able to perform as much work in two days as another will in four, and in the two days the file is worn out. An inexperienced workman can destroy a file in a day and not do but little work. There is therefore no rule to follow but the one, to substitute an new for an old as soon as the file becomes worn.

The finishers' bench should be provided with a variety of files. The following gives a good assortment. One 17-inch flat bastard for "roughing," one 14-inch flat bastard, and one 13-inch half round bastard, each worn for scaling. One flat bastard and one half round bastard, same lengths as those worn, for use as soon as scales, etc., are removed. One 8-inch flat bastard for fitting. One 8-inch and one 10-inch square bastard, and one 8-inch and one 10-inch round bastard for truing up bolt holes. One 12-inch float for filing drills; one 6-inch round for sharpening wood boring tools. In addition to these there should be a rack of small round, square, half round and three corner files for special uses. The roughing files should be those that have been used in the woodshop until the sharp burs are worn off.

In addition to these there should be a hot iron file. This should be 24 inches long and about  $1\frac{1}{2}$  inches wide, both faces flat, one edge round, the other square. This is for use at points where the swage or cold chisel cannot be used.

# No. 4.

**Table of Kinds and Sizes of Iron Used in Constructing a Pony Phaeton on Two Springs, 4 Feet 8 Inch or 4 Feet 10 Inch Truck.**

Sectional Parts.	Metal.	Shape.	Size.
Axles.	Steel.	Nat.	1x6 $\frac{1}{2}$ inches.
Piece part, front.	Burden's iron.		1 $\frac{1}{4}$ x $\frac{3}{8}$ inch.
Piece part, back.			1 $\frac{1}{2}$ x $\frac{7}{8}$ inch.
Springs, front, four plates.			1 $\frac{3}{8}$ inches.
Length.			36 inches.
Open.			7 inches.
Main and second plates.			No. 3.
Additional plates.			No. 4.
Back, five plates.	Oil temper, Swedes Elliptic, square ends; steel.	1 $\frac{1}{2}$ steel, button heads.	37 inches.
Length.			9 $\frac{1}{2}$ inches.
Open.			No. 2.
Main plates.			No. 3.
Second and third plates.			No. 4.
Additional plates.			
Fifth wheel.		Half circle.	15 inches.
Circles.	Norway iron.	Half round.	1 $\frac{1}{2}$ inch.
Bolts.	Norway iron.		1 $\frac{1}{4}$ inch.
Shaft irons.	Ulster iron.	Flat half oval.	1 $\frac{1}{4}$ x $\frac{5}{8}$ inch.
Jacks.		Plain.	1 $\frac{3}{8}$ inches.
Bolts.	Norway iron.		1 $\frac{1}{4}$ inch.
Perch plate, front end.	Norway iron.		1 $\frac{1}{4}$ x $\frac{5}{8}$ inch.
Back end.	Norway iron.		
Bolts.	Norway iron.		
Center.	Ulster iron.	Flat.	1 $\frac{1}{4}$ x $\frac{1}{4}$ inch.
Top plate.	Norway iron.	Half oval.	1 $\frac{1}{4}$ x $\frac{5}{8}$ inch.
Side stays.	Burden's iron.		
Outside and inner back branch.		Oval.	5 $\frac{1}{2}$ x $\frac{3}{8}$ inch.
Inner front branch.		Oval.	5 $\frac{1}{2}$ x $\frac{5}{8}$ inch.
Heels.			
Body loops.	Norway iron.		
Front.	Ulster iron.	Square.	7 $\frac{1}{2}$ inch.
At butt.		Oval.	7 $\frac{1}{2}$ x $\frac{5}{8}$ inch.
At bar.		Oval.	3 $\frac{1}{4}$ x $\frac{7}{8}$ inch.
Head.			7 $\frac{1}{2}$ inch.
Back.		Square.	1 inch.
At butt.		Oval.	11 $\frac{1}{2}$ x $\frac{7}{8}$ inch.
At bar.		Oval.	1 $\frac{1}{2}$ x $\frac{5}{8}$ inch.
Head.			7 $\frac{1}{2}$ inch.
Bolts.	Norway iron.		1 $\frac{1}{4}$ inch.
Clip king bolt.	Norway iron.		3 $\frac{1}{4}$ inch.
Spring portion.			1 $\frac{1}{4}$ inch.
Clips.	Norway iron.	Flat.	3 $\frac{1}{4}$ inch.
Ends.			3 $\frac{1}{4}$ inch.
Tire.	Steel.		1 $\frac{1}{4}$ x $\frac{5}{8}$ inch.
Tire.	Compound iron.		1 $\frac{1}{4}$ x $\frac{5}{8}$ inch.
Tire.	Iron.		1 $\frac{1}{4}$ x $\frac{1}{4}$ inch.
Bolts.		Tire.	1 $\frac{1}{4}$ inch.
Step.	Norway iron.	Gridiron.	11 $\frac{1}{2}$ x5 $\frac{1}{2}$ inches.
Branches.	Burden's iron.	Oval.	3 $\frac{1}{4}$ x $\frac{1}{2}$ inch.
Bolts.	Norway iron.		7 $\frac{1}{2}$ inch.
Dash.			15 inches high.
End and bottom bars.	Ulster iron.	Oval.	3 $\frac{1}{4}$ x $\frac{3}{8}$ inch.
Center, top and end bars.	Ulster iron.	Oval.	5 $\frac{1}{2}$ x $\frac{3}{8}$ inch.
Feet.	Norway iron.		
Foot rod.	Ulster iron.	Oval.	3 $\frac{1}{4}$ x $\frac{1}{2}$ inch.
Lining to top of basket.	Band iron.		2 $\frac{1}{4}$ inch. No. 14.
Joints, back.	Norway iron.	Stump joint.	3 $\frac{1}{4}$ x $\frac{3}{8}$ inch.
Piece part.	B. B. iron.	Oval.	2 $\frac{1}{4}$ x $\frac{1}{2}$ inch.
Front.	Norway iron.	Stump joint.	5 $\frac{1}{2}$ x $\frac{5}{8}$ inch.
Piece part.	B. B. iron.	Oval.	5 $\frac{1}{2}$ x $\frac{3}{8}$ inch.
Rocker plates.	L. W. iron.		1 $\frac{1}{2}$ x $\frac{5}{8}$ inch.
Screws.	Norway iron.		No. 14.
Spring bar bolts.			3 $\frac{1}{8}$ inch.

## TONGS.

The blacksmiths' tong-rack should be well stored with tongs. To hold the iron well it is necessary that the jaws take a full hold, beginning with the closest there should be two pairs  $\frac{1}{2}$  of an inch open, two of  $\frac{1}{4}$  inch, two of  $\frac{3}{8}$ , two of  $\frac{1}{2}$  inch, and one for each  $\frac{1}{4}$  of an inch up to 1 inch, and one pair for each  $\frac{1}{4}$  of an inch above that size. This will obviate the necessity of the blacksmith occasionally heating the jaws of his tongs and adjusting them to the piece of iron to be held. The firmer the jaws clench the iron the easier is it to hold it. Every blacksmith knows that the hand that holds the tongs is tireder at night than the one that holds the hammer. This is due to the strain from a tight grip. To make the tongs grip the iron more firmly some blacksmiths rough the face of the jaws. If the tongs are of the proper size this is entirely unnecessary.

Tongs should be made of hard iron, such as Low Moor, Ulster or Burdens. The soft irons are not sufficiently rigid to sustain the strain without bending. Drill the rivet holes instead of punching them. If the jaws work loose heat the rivets and lighten upon the forge, then return the tongs to the fire, heat them red and open and close them until they work easy.

# No. 5.

**Table of Kinds and Sizes of Iron Used in Constructing a Pony Phaeton, perch carriage, three springs, 4 feet 10 inch Track.**

Sectional Parts.	Metal.	Shape.	Size.
Axle, front.....	Steel.....	Plain taper.....	$7\frac{3}{8} \times 6\frac{1}{2}$ inch.
Piece part, front.....	Burden's iron.....	Plain taper.....	$1\frac{1}{4} \times 1$ inch.
Back.....	Steel.....	Plain taper.....	$1 \times 6\frac{1}{2}$ inches.
Piece part, back.....	Burden's iron.....		$1\frac{1}{4} \times 1\frac{1}{8}$ inches.
Springs, elliptic.....			$1\frac{1}{4}$ inches.
Front.....			3 plates.
Length.....			$3\frac{7}{8}$ inches.
Open.....			8 inches.
Main plate.....	Swedes steel, oil temper.	Elliptics; button heads; top plates	No. 3.
Additioaal plates.....		spear points; bottom plates oval points.	No. 4.
Back.....			4 plates.
Length.....			$3\frac{5}{8}$ inches.
Open.....			8 inches.
Main and second plates.....			No. 3.
Additional plates.....			No. 4.
Fifth wheel.....	Norway iron.....	Half round.....	15 inches.
Plates.....			$1\frac{1}{2}$ inch.
Bolts.....	Norway iron.....		
Perch plate, head portion.....	Norway iron.....		$1\frac{1}{4} \times 3\frac{3}{8}$ inches.
Back end.....	Norway iron.....		$1\frac{1}{4} \times 3\frac{3}{8}$ inches.
Center.....	Burden's iron.....	Swaged.....	$1\frac{1}{4} \times 1\frac{7}{16}$ inches.
Back plate clip.....	Norway iron.....	Half oval.....	$1\frac{1}{4} \times 1\frac{1}{4}$ inches.
Bolt part.....			$\frac{3}{8}$ inch.
Strap, wide.....			$1\frac{1}{2}$ inches.
Spring clips.....	Norway iron.....	Oval.....	$\frac{7}{8}$ inch thick.
Stay portion.....	Low Moor iron.....	Oval.....	$7\frac{3}{8} \times 2$ inch.
Head block stay.....	Norway iron.....	Half oval.....	$1 \times \frac{1}{2}$ inch.
Shaft irons.....	Burden's iron.....		$1\frac{3}{8} \times \frac{1}{2}$ inches.
Length on bar.....			8 inches.
Length front of bar.....			10 inches.
Goose neck at shaft end.....		Oval.....	$1\frac{1}{4} \times 3\frac{1}{4}$ inches.
At head.....		Oval.....	$7\frac{3}{8} \times \frac{3}{8}$ inch.
Head.....			$\frac{1}{8}$ inch.
Jack.....	Norway iron.....	Plain pattern.....	
Bolt.....			$7\frac{1}{8}$ inches.
Pole plate to T.....	Norway iron.....		$1\frac{1}{4} \times \frac{7}{16}$ inches.
Piece out with.....	Burden's iron.....	Half oval.....	$7\frac{3}{8} \times \frac{3}{8}$ inch.
Top plate.....	Norway iron.....		12 inches long.
Goose necks.....	Low Moor iron.....	Round.....	$\frac{3}{4}$ inch.
At head.....			$\frac{5}{8}$ inch.
Side stays.....	Low Moor iron.....	Oval.....	$\frac{3}{4} \times \frac{7}{16}$ inch.
Body loops.....	Burden's iron.....	Square.....	$\frac{7}{8}$ inch.
At head.....		Oval.....	$\frac{3}{4}$ inch.
Head.....			$\frac{7}{8}$ inch.
Bolts.....	Norway iron.....		$\frac{3}{8}$ inch.
For body.....	Norway iron.....		$\frac{7}{16}$ inch.
Brakes or back locps.....	Low Moor iron.....	Full oval.....	$1\frac{1}{8} \times 1$ inch.
Taper end, back spring flange.....			$3\frac{1}{4} \times 1\frac{1}{2}$ inch.
Clip king bolt.....	Norway iron.....		$\frac{3}{4}$ inch.
Spring portion.....	Norway iron.....	Flat.....	$\frac{7}{16}$ inch.
Clips.....	Norway iron.....		$\frac{1}{8}$ inch.
Ends.....			$\frac{3}{8}$ inch.
Tire.....	Iron.....		$1\frac{1}{8} \times \frac{5}{8}$ inches.
Tire.....	Compound iron.....		$1\frac{1}{8} \times 1\frac{1}{4}$ inches.
Tire.....	Steel.....		$1\frac{1}{8} \times \frac{5}{8}$ inches.
Bolts.....	Norway iron.....	Tire.....	$\frac{7}{16}$ or $\frac{1}{4}$ inch.
Spring bolts.....	Norway iron.....	Gridiron.....	$\frac{3}{8}$ inch.
Step pad.....	Burden's iron.....		$4 \times 5$ inches.
Shank.....			$\frac{3}{4}$ inch.
At pad.....		Round.....	$\frac{5}{8}$ inch.
Branches.....	Low Moor iron.....	Oval.....	$\frac{3}{4} \times \frac{3}{8}$ inch.
Foot rod.....	Common iron.....	Oval.....	$7\frac{3}{8} \times \frac{5}{16}$ inch.
Rail to rumble seat.....	Burden's iron.....	Round.....	$\frac{3}{8}$ inch.
Pad to rumble seat.....			$4 \times 4\frac{1}{2}$ inches.
Shank.....	Low Moor iron.....	Oval.....	$1 \times 3\frac{1}{4}$ inch.
Dash, hight.....			20 inches.
Project at ends.....			5 inches.
Section wing, length.....			12 inches.
Bottom and heel bars.....	Low Moor iron.....	Oval.....	$\frac{3}{4} \times \frac{3}{8}$ inch.
All other bars.....	Low Moor iron.....	Oval.....	$\frac{5}{8} \times \frac{3}{8}$ inch.
Heels.....	Norway iron.....		
Rocker plates.....	Burden's iron.....		$1\frac{3}{4} \times 1\frac{1}{4}$ inches.
Screws.....			No. 14.

## COLD CHISELS.

The cold chisel, if properly made, is a valuable and a labor saving tool; with it ridges and thick parts may be cut away in less than half the time that it could be done with a file. A perfect chisel should be wedge shape, at an angle that would give  $\frac{1}{16}$  of an inch at the lower end and  $\frac{3}{8}$  of an inch at a point  $1\frac{1}{2}$  inches above; draw the taper perfectly true and file off the end square and grind each edge to give a bevel of  $\frac{1}{8}$  of an inch; the temper must be made to suit the article to be cut, it will not do to use the one chisel on all kinds of metal. A chisel that would work well on steel or hard iron would be likely to break if used on soft metals, while the one that would work the best on soft metals would be too soft to cut the hard metals.

# No. 6.

**Table of the Kinds and Sizes of Iron Used in Constructing a Pony Phaeton With Rumble, Upon Platform Coupe Futchel Carriage; Track, 4 Feet 8 Inches, or 4 Feet 10 Inches.**

Sectional Parts.	Metal.	Shape.	Size.
Axles.	Case hardened iron.	Nut or nail.	1x6 $\frac{1}{2}$ inches.
Piece part.	Low Moor iron.		1x1 $\frac{1}{2}$ inches.
Springs.			1 $\frac{1}{4}$ x1 $\frac{1}{2}$ inches.
Front.			3 plates.
Length.			30 inches.
Open.			6 inches.
All plates.			No. 3.
Back.	Sweden steel, oil temper.	Full elliptics, button heads; square ends to plates; ends to top plates long beveled.	4 plates.
Length.			36 inches.
Open.			7 inches.
Main plate.			No. 2.
Second and third plates.			No. 3.
Fourth.			No. 4.
1f 1 $\frac{1}{4}$ inch steel is prefered, all plates.			No. 3.
Fifth wheel.	Ulster iron.	Half circle.	1x4 inch.
Bottom bed, bottom plate.		Half round.	1 $\frac{1}{4}$ x $\frac{5}{8}$ inch.
Bottom bed, top plate.	Common iron.	Half oval.	3x $\frac{7}{8}$ inch.
Top bed, top plate.	Norway iron.	Half round.	7x $\frac{1}{2}$ inch.
Socket plate.	Norway iron.	Half oval.	1x $\frac{3}{4}$ inch.
Back bar, top carriage.	Low Moor iron.	Full oval.	1x $\frac{5}{8}$ inch.
Bottom socket.	Norway iron.	Half oval.	1x $\frac{3}{4}$ inch.
Bottom plate of futchels.	Burden's iron.		$\frac{5}{8}$ inch.
Back end.	Common iron.	Half oval.	6x $\frac{3}{8}$ inch.
Front end.	Common iron.	Half oval.	1x $\frac{3}{8}$ inch.
Inside plate of futchels.	Norway iron.		1x $\frac{3}{8}$ inch.
Front ends.	Burden's iron.		
Side stay.		Round.	1 $\frac{1}{4}$ x $\frac{5}{8}$ inch.
Ends.			$\frac{9}{16}$ inch.
King bolt.	Norway iron.		1 $\frac{1}{2}$ inch.
Trace knobs.		Ronnd heads.	2 inches.
Pole socket.			2 $\frac{1}{4}$ x2 inches.
Draw bar, bottom plate.	Norway iron.	Flat half oval.	1 $\frac{1}{4}$ x $\frac{7}{8}$ inch.
Bolts.	Norway iron.		1 $\frac{1}{4}$ inch.
Box clips.	Burden's iron.		1 $\frac{1}{4}$ x $\frac{5}{8}$ inch.
Bottom plates for shafts.	Norway iron.	Half oval.	1x $\frac{5}{8}$ inch.
Front loops to body.	Burden's iron.	Swaged.	1 $\frac{1}{4}$ inch.
Front ends.	Norway iron.	Oval.	1x $\frac{3}{4}$ inch.
Bolts.			$\frac{3}{8}$ inch.
Dash, hight.	Norway iron.		22 inches.
Main and bottom bars.	Norway iron.	Oval.	3x $\frac{3}{4}$ inch.
Additional bars.	Norway iron.	Oval.	5x $\frac{3}{8}$ inch.
Rein roll.	Norway iron.	Round.	$\frac{3}{8}$ inch.
Bolts.	Norway iron.		$\frac{5}{16}$ inch.
Back wings.	Norway iron.	Oval.	5x $\frac{3}{8}$ inch.
Brakes.	Low Moor iron.	Full oval.	1x1 $\frac{1}{8}$ inches.
Flange for rumble irons.	Ulster iron.	Round.	3x $\frac{1}{2}$ inch.
Rail to rumble seat.			$\frac{9}{8}$ inch.
Step pads.	Sheet iron.		No. 10.
Tread.		Oval.	6x10 inches.
Shank.	Ulster iron.	Octagon.	$\frac{7}{8}$ inch.
Bolts.	Norway iron.		$\frac{7}{16}$ inch.
Tire.	Common iron.		11x $\frac{5}{8}$ inch.
Tire.	Low Moor iron.		11x $\frac{1}{4}$ inches.
Tire.	Steel.		11 $\frac{1}{8}$ x $\frac{7}{8}$ inch.
Bolts.	Norway iron.	Tire.	$\frac{3}{8}$ inch.
Rumble step pad.	Sheet iron.		4x $\frac{1}{2}$ inches.
Shank.	Low Moor iron.	Swaged.	1x $\frac{3}{4}$ inches.
Rockier plates.	Burden's iron.		1 $\frac{3}{4}$ x $\frac{1}{4}$ inch.
Screws.			No. 14.
Hub bands.	Band iron.		$\frac{1}{2}$ inch.

## BRAZING.

Brazing is a simple process, but one that requires care. The article to be brazed must be cleaned thoroughly at the joint, and the edges brought well together, then place the brazing material over the joint; moisten borax in water and place a quantity along the joint; hold the piece over a good charcoal or a clean hard coal fire until the brazing material is melted, jar it slightly to cause it to enter the joint; as soon as melted remove from the fire; if the article brazed is brass or copper plunge it in cold water, if iron, allow it to cool slowly. In brazing brass use silver, for iron or steel thin strips of spelter or sheet brass.

## MOLTEN LEAD FOR TEMPERING.

The use of molten lead for tempering was for a long time kept as a secret by the discoverer. Its uses are, however, not confined to the tool maker; delicate tools can be heat all parts alike by being put into the boiling lead, their heat not exceeding that of the lead. It is sometimes desirable to anneal a portion of an article that has been tempered, this can be done without drawing the temper at other points by dipping the part to be annealed in hot lead; it acts equally well with all metals and should be ever present on the blacksmiths' forge.

# No. 7.

**Table of Kinds and Sizes of Iron Used in Constructing a Doctor's Phaeton Weighing About 450 Pounds.**

Sectional Parts.	Metal.	Shape.	Size.
Axes, nut.....	Case hardened.....	Plain taper.....	$1\frac{1}{2}$ x $7$ inches.
Piece part.....	Burden's iron.....	Square.....	$1\frac{1}{2}$ x $1\frac{1}{4}$ inch.
Springs, four plates.....	Swedes steel.....	Elliptic, round point.....	$1\frac{1}{2}$ inches.
Front, length.....			37 inches.
Open.....			$8\frac{1}{2}$ inches.
Main and second plates.....			No. 3.
Additional plates.....			No. 4.
Back, length.....			39 inches.
Open.....			10 inches.
Plates.....			No. 4.
Fifth wheel.....	Norway iron.....	Half circle.....	16 inches.
Fifth wheel at bearing.....			1 inch.
Shaft iron heads.....	Burden's iron.....	Cone head.....	$1\frac{1}{2}$ inches.
Bolts.....	Norway iron.....	Flat oval.....	$\frac{1}{2}$ inch.
Ears of jack clips, thick.....	Norway iron.....	Turned heads.....	$1\frac{3}{4}$ x $1\frac{1}{4}$ inch.
Shaft irons.....	Burden's iron.....	Flat.....	$\frac{5}{8}$ inch.
Bolts.....	Norway iron.....	Flat.....	$1\frac{1}{2}$ inches.
Jack clips.....	Norway iron.....	Round.....	$3\frac{1}{8}$ inch.
Screw end.....	Norway iron.....	Flat.....	$1\frac{1}{4}$ inches.
Axle clips.....	Norway iron.....	Flat.....	$1\frac{1}{4}$ inches.
Screw ends.....	Norway iron.....	Round.....	$\frac{5}{8}$ inch.
Perch plate, bottom, ends.....	Norway iron.....	Flat.....	$\frac{5}{8}$ x $1\frac{1}{4}$ inches.
Perch plate, bottom, center.....	Ulster iron.....	Flat.....	$\frac{7}{8}$ x $1\frac{1}{4}$ inches.
Perch plate, top.....	Norway iron.....	Flat.....	$\frac{7}{8}$ x $\frac{7}{8}$ inch.
Perch plate, swaged.....		Half oval.....	1 inch.
Perch bolt.....	Norway iron.....	Cone head.....	$\frac{5}{8}$ inch.
Side stays, main.....	Burden's iron.....	Oval.....	$\frac{7}{8}$ x $3\frac{1}{4}$ inch.
Side stays, inside.....	Burden's iron.....	Oval.....	$3\frac{1}{2}$ x $\frac{5}{8}$ inch.
Side stays, ends at heels.....	Norway iron.....	Flat.....	$\frac{5}{8}$ inch.
Bolts at head block.....	Norway iron.....	Cone heads.....	$\frac{5}{8}$ inch.
Bolts at branch of stays.....	Norway iron.....	Flat heads.....	$\frac{3}{8}$ inch.
Bolts for front end.....	Norway iron.....	Flat heads.....	$\frac{4}{5}$ inch.
Spring and spring bar clips.....	Norway iron.....	Flat.....	1 inch.
Ends.....	Norway iron.....	Round.....	$3\frac{1}{8}$ inch.
Clip king bolt.....	Norway iron.....	Round.....	No. 3.
At head plate.....		Round.....	$3\frac{1}{8}$ inch.
Spring section.....		Round.....	$\frac{7}{8}$ inch.
Boss to fifth wheel stay.....	Norway iron.....	Round.....	$\frac{3}{4}$ inch.
Body loops, front.....	Burden's iron.....	Oval.....	1 inch.
Back.....	Burden's iron.....	Oval.....	$1\frac{1}{2}$ inches.
Head at base.....			$1\frac{1}{2}$ inches.
Bolts for heads.....	Norway iron.....	Cone heads.....	$\frac{7}{8}$ inch.
Bolts at butts.....	Norway iron.....	Round heads.....	$\frac{5}{8}$ inch.
Additional bolts.....		Round heads.....	$\frac{5}{8}$ inch.
Tire.....	Compound iron.....		$1\frac{1}{4}$ x $\frac{7}{8}$ inch.
Tire.....	Steel.....	Tire.....	$1\frac{1}{4}$ x $1\frac{1}{4}$ inch.
Tire bolts.....	Norway iron.....	Gridiron.....	
Step pads.....	Norway iron.....	Octagon and round.....	$4\frac{1}{2}$ x 5 inches.
Shanks.....	Ulster iron.....		$\frac{3}{4}$ inch.
Dash.....	B. B. iron.....	Oval.....	16 inches high.
Dash, outside and top bars.....	B. B. iron.....	Oval.....	$3\frac{1}{2}$ x $\frac{7}{8}$ inch.
Dash, inner bars and handles.....	B. B. iron.....	Oval.....	$3\frac{1}{2}$ x $\frac{3}{8}$ inch.
Foot rod.....	Ulster iron.....	Oval.....	$1\frac{1}{2}$ x $\frac{7}{8}$ inch.
Stump joints, bottom prop.....	B. B. iron.....	Oval.....	$3\frac{1}{2}$ x $\frac{7}{8}$ inch.
Piece part.....	Norway iron.....	Oval.....	$1\frac{1}{2}$ x $\frac{7}{8}$ inch.
Front prop.....	B. B. iron.....		$1\frac{1}{2}$ x $\frac{3}{4}$ inch.
Piece part.....	Norway iron.....	Oval.....	$3\frac{1}{2}$ x $\frac{3}{4}$ inch.
Hub bands.....		Band.....	$\frac{1}{2}$ x 2 inches.
Rocker plates.....	L. W. iron.....	Flat.....	$3\frac{1}{2}$ x 2 inches.
Screws.....			No. 16.

## DRILLING IRON.

Wherever it is possible, it is best to drill holes through the iron; the process is not a tedious one, if almost any one of the power drills in the market are employed and twist drills used. Drillery cuts the metal away in such small particles that no damage is done, whereas the punch is liable to produce fractures. If square holes are desired, drill and then file out with a square file.

## CARE OF THE BELLOWs.

A well-made bellows should last twenty-five years, if well treated, but it is doubtful if one out of twenty lasts ten years, without a great deal of patching. The constant working of the bellows produces friction which tends to wear away the leather, but much of this may be obviated by keeping it clean; if well dusted daily, its wearing qualities will be greatly increased.

## TO TEMPER CUTTING TOOLS.

Heavy cutting tools, like axes, can be tempered so as to carry a keen, strong edge by heating to a red heat and running it down to a blue in warm rain water. If very heavy heat and cool twice.

# No. 8.

Table of Kinds and Sizes of Irons Used in Constructing a Four-Sent Rockway, Shifting Front, 4 feet 10 inch Track.

Sectional Parts.	Metal.	Shape.	Size.
Axles, nut.....	Iron, case hardened.	Plain taper.....	1 $\frac{1}{4}$ x 7 inches.
Piece part, back.....	Low Moor iron .....	Bar.....	1 x 1 $\frac{1}{2}$ inches.
Piece part, front.....	Low Moor iron .....	Bar.....	1 x 1 $\frac{3}{8}$ inches.
Springs, five plates.....			{ 1 $\frac{3}{8}$ and 1 $\frac{1}{2}$ inches.
Front, length.....			37 inches.
Open.....		Elliptic, round points	7 inches.
Main plate.....		to top plates, and	No. 2.
Second and third plates.....	Swedes steel.	square points to bot-	No. 3.
Fourth and fifth plates.....		tom plates, French	No. 4.
Back, length.....		clips, front 1 $\frac{3}{8}$ , back	39 inches.
Open.....		1 $\frac{1}{2}$ .	9 $\frac{1}{2}$ inches.
Main and second plates.....			No. 2.
Additional plates.....			No. 3.
Fifth wheel.....	Norway iron.....		15 inches.
Circles.....	Norway iron.....	Half round.....	1 inch.
Bolts.....	Norway iron.....		$\frac{1}{4}$ inch.
Shaft irons.....	Burden's iron.....	Swaged.....	1 $\frac{1}{4}$ x 1 $\frac{1}{8}$ inch.
Length front of bar.....			14 inches.
Length on bar.....			10 inches.
Bolts.....	Norway iron.....		$\frac{1}{8}$ inch.
Jacks.....	Norway iron.....	Plain.....	1 $\frac{1}{4}$ inch.
Heads, long.....	Norway iron.....	Round.....	$\frac{1}{4}$ inch.
Bolts.....	Norway iron.....	Turned heads.....	1 $\frac{1}{4}$ inch.
Clips .....	Norway iron.....	Strap.....	1 inch.
Bolt end.....		Round.....	$\frac{1}{8}$ inch.
Perch plate, bottom end.....	Norway iron.....		3 $\frac{1}{2}$ x 1 $\frac{1}{4}$ inch.
Center.....	Burden's iron.....	Flat.....	3 $\frac{1}{2}$ x 1 $\frac{1}{4}$ inch.
Top.....	Norway iron.....	Half oval.....	1 $\frac{1}{8}$ x 1 $\frac{1}{8}$ inch.
Bolts.....	Norway iron.....	Turned heads.....	$\frac{1}{4}$ inch.
Head plates.....	Norway iron.....	Half oval.....	1 $\frac{1}{8}$ x 1 $\frac{1}{8}$ inch.
Side stays, outside and back.....	Low Moor iron.....	Oval.....	3 $\frac{1}{2}$ x 5 $\frac{1}{8}$ inch.
Front branch.....	Low Moor iron.....	Oval.....	$\frac{1}{2}$ x 5 $\frac{1}{8}$ inch.
Ends at head block.....	Norway iron.....	Half oval.....	1 x 1 $\frac{1}{4}$ inch.
Bolts.....	Norway iron.....	Turned heads.....	$\frac{1}{4}$ inch.
Spring bar bolts.....	Norway iron.....	Turned heads.....	3 $\frac{1}{8}$ inch.
Clip king bolt.....	Norway iron.....	Plain.....	1 inch.
Bolt part.....	Norway iron.....	Round.....	$\frac{3}{4}$ inch.
Body loops, back.....	Low Moor iron.....	Swaged.....	7 $\frac{1}{2}$ x 1 $\frac{1}{8}$ inch.
Heads at loops.....	Low Moor iron.....	Round.....	1 inch.
Bolts.....	Norway iron.....	Turned heads.....	3 $\frac{1}{8}$ inch.
Tire .....	Common iron.....	Flat.....	1 $\frac{1}{4}$ x 1 $\frac{1}{4}$ inch.
Tire .....	Compound iron.....	Flat.....	1 $\frac{1}{4}$ x 1 $\frac{1}{4}$ inch.
Tire .....	Steel.....	Flat.....	1 $\frac{1}{2}$ x 1 $\frac{1}{4}$ inch.
Bolts .....	Norway iron.....	Tire.....	$\frac{1}{4}$ inch.
Step pad without covers.....	Main branch.....	Square.....	6 $\frac{1}{2}$ x 8 inches.
	At pad.....	Octagon and square.....	7 $\frac{1}{2}$ inch.
	Pad, if cover is used.....	Oval.....	1 $\frac{1}{2}$ x 3 $\frac{1}{4}$ inch.
	Back straps.....	Horseshoe.....	5 $\frac{1}{2}$ x 7 inches.
	Bolts .....	Oval.....	3 $\frac{1}{2}$ x 3 $\frac{1}{4}$ inch.
	Cover.....	Norway iron.....	Turned heads.....
Dash, bight.....		Sheet iron, No. 10.....	3 $\frac{1}{8}$ inch.
Bars.....	Low Moor iron .....	Oval.....	15 inches.
Foot rod.....	Burden's iron.....	Oval.....	3 $\frac{1}{4}$ x 3 $\frac{1}{8}$ inch.
Hub bands, wrought.....	Norway iron.....	Plain.....	1 $\frac{1}{8}$ inch thick.
Side rail to front seat.....	Burden's iron.....	Round.....	$\frac{1}{8}$ inch.
Railroad back uprights.....	Ulster iron.....	Oval.....	1 $\frac{1}{8}$ x 7 $\frac{1}{8}$ inch.
Bottom.....	Ulster iron.....	Half oval.....	1 $\frac{1}{8}$ inch.
Bolt.....	Norway iron.....	Flat head.....	$\frac{1}{8}$ inch.
Height.....			15 inches.
Arch plates.....	Ulster iron .....	Half oval.....	1 $\frac{1}{4}$ x 3 $\frac{1}{4}$ inch.

## WORKING STEEL.

Steel to be forged must be heat evenly and as quickly as possible, without burning the thin parts; before forging be sure that the piece is heat through, and then commence upon the thin parts as they cool the quickest. Work quickly and boldly, reducing the power of the blows as the color darkens, and cease hammering just as soon as the bright redness is lost. There are scarcely two brands of steel that can be worked in a similar manner, and in order to secure uniformity the workman should carefully note the method of working, and having accomplished a good result he should continue the use of the one grade.

## SAWDUST.

A box of sawdust should be at every finisher's bench; there is nothing superior to it for cleaning iron of grease; it absorbs the grease rapidly, and the use of it saves time in cleaning up irons that have been drilled. Any kind will answer but pine; this leaves a resinous deposit that is very objectionable.

# No. 9.

**Table of Kinds and Sizes of Iron Used in Constructing a Four-Passenger Rockaway on Three Springs and Perch Carriage. Track, 4 Feet 8 Inches or 4 Feet 10 Inches.**

Sectional Parts.	Metal.	Shape.	Size.
Axles, front	Case hardened	Nnt.	1 <sup>1</sup> / <sub>2</sub> x 7 inches.
Back	Case hardened	Nnt.	1 <sup>1</sup> / <sub>2</sub> x 7 inches.
Piece part, front	Low Moor iron	1 x 1 <sup>1</sup> / <sub>2</sub> inch.	
Piece part, back	Low Moor iron	1 x 1 <sup>1</sup> / <sub>2</sub> inch.	
Springs			
Front			1 <sup>1</sup> / <sub>2</sub> inches.
Length			6 plates.
Open			38 inches.
Main and second plates			10 <sup>1</sup> / <sub>2</sub> inches.
Third and fourth plates			No. 2.
Fifth and sixth plates			No. 3.
Back			No. 4.
Length			4 plates.
Open			37 inches.
Main plate			7 <sup>1</sup> / <sub>2</sub> inches.
Second plate			No. 2.
Third and fourth plates			No. 3.
Fifth wheel		Half circle.	15 inches.
Plates	Burden's iron	Half round.	1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>2</sub> inches.
Bottom clips	Burden's iron		3 <sup>1</sup> / <sub>2</sub> wide.
Bolt ends			3 <sup>1</sup> / <sub>2</sub> inch.
Front bar to upper section	Burden's iron	Round.	3 <sup>1</sup> / <sub>2</sub> inch.
Stay	Norway iron		1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>2</sub> inches.
Neck portion		Oval.	1 <sup>1</sup> / <sub>2</sub> x 2 inch.
Shaft irons	Ulster iron	Half oval.	1 <sup>3</sup> / <sub>8</sub> x 5 <sup>1</sup> / <sub>2</sub> inches.
Length on bar			10 inches.
Front of bar.			12 inches.
Head			1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>2</sub> inches.
Bolts	Norway iron		5 <sup>1</sup> / <sub>2</sub> inch.
Jack clips	Norway iron		1 <sup>1</sup> / <sub>2</sub> inches wide.
Strap			1 <sup>1</sup> / <sub>2</sub> inch.
Ends			7 <sup>1</sup> / <sub>2</sub> inch.
Bolts			2 inch.
Pole, bottom plate on the bar	Norway iron		
Top plate	Burden's iron	Half oval	1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>2</sub> inches.
Onfer stay	Norway iron	Half oval	1 x 1 <sup>1</sup> / <sub>2</sub> inches.
Inside branches	Burden's iron	Oval.	3 x 3 <sup>1</sup> / <sub>2</sub> inch.
Necks	Burden's iron	Oval.	5 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inch.
At heads	Burden's iron	Round.	3 <sup>1</sup> / <sub>2</sub> inch.
Bolts for plates	Norway iron	Round.	5 <sup>1</sup> / <sub>2</sub> inch.
Bolts for stays	Norway iron		3 <sup>1</sup> / <sub>2</sub> inch.
Bolt for double tree	Norway iron		5 <sup>1</sup> / <sub>2</sub> inch.
Bolt for Whiffletree	Norway iron		3 <sup>1</sup> / <sub>2</sub> inch.
Perch plate, front end	Norway iron		1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>2</sub> inches.
Piece out with	Burden's iron	Half oval	1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>2</sub> inches.
Back end	Norway iron		1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>2</sub> inches.
Clip	Norway iron	Half oval	1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>2</sub> inches.
Ends		Round.	3 <sup>1</sup> / <sub>2</sub> inch.
Top plate		Half oval	1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>2</sub> inches.
Side stays	Norway iron	Oval.	1 x 5 <sup>1</sup> / <sub>2</sub> inch.
Perch portion	Norway iron	Half oval	1 x 2 inch.
Extra stay at head block	Low Moor iron	Oval.	3 x 7 <sup>1</sup> / <sub>2</sub> inches.
Branch stays	Low Moor iron	Oval.	5 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inch.
Axle clips, front.	Norway iron		1 <sup>1</sup> / <sub>2</sub> inches.
Ends			3 <sup>1</sup> / <sub>2</sub> inch.
Spring clips	Norway iron		1 <sup>1</sup> / <sub>2</sub> x 1 <sup>1</sup> / <sub>2</sub> inches.
Brakes	Ulster iron	Swaged half oval	1 <sup>1</sup> / <sub>2</sub> inches.
Bolts at springs			3 <sup>1</sup> / <sub>2</sub> inch.
Tire	Steel		1 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inches.
Tire	Compound iron		1 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inches.
Bolts	Norway iron	Tire.	1 <sup>1</sup> / <sub>2</sub> inch.
Step	Sheet iron	Horseshoe.	No. 10.
Pad			5 x 5 <sup>1</sup> / <sub>2</sub> inches.
Shank	Burden's iron	Square.	7 <sup>1</sup> / <sub>2</sub> inch.
At pad		Round.	5 <sup>1</sup> / <sub>2</sub> inch.
Bolt part	Norway iron		1 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inches.
Cover	Sheet iron		No. 14.
Flange	Band iron		7 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inch.
Shank	Burden's iron	Octagon.	5 <sup>1</sup> / <sub>2</sub> inch.
At cover		Round.	1 <sup>1</sup> / <sub>2</sub> incl.
Step bolts	Norway iron		3 <sup>1</sup> / <sub>2</sub> inch.
Dash		Straight.	1 <sup>1</sup> / <sub>2</sub> x 2 inches high.
Heels	Norway iron		1 <sup>3</sup> / <sub>4 x 1<sup>1</sup>/<sub>2</sub> inches.</sub>
Outer and bottom bars	Ulster iron	Oval.	5 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inch.
Additional bars	Ulster iron	Oval.	5 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inch.
Handles	Ulster iron	Oval.	5 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inch.
Bolts	Norway iron		7 <sup>1</sup> / <sub>2</sub> inch.
Side rails	Ulster iron	Round.	7 <sup>1</sup> / <sub>2</sub> x 2 inch.
Railroad backs, bottom	Ulster iron	Half oval.	7 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inch.
Uprights	Ulster iron	Oval.	3 x 7 <sup>1</sup> / <sub>2</sub> inch.
Height			16 <sup>1</sup> / <sub>2</sub> inches.
Rocker plates at neck	L. W.		2 <sup>1</sup> / <sub>2</sub> x 1 <sup>1</sup> / <sub>2</sub> inches.
Ends	L. W.		2 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>2</sub> inches.
Screws			No. 18.
Hnb bands, back	Band iron		3 x 3 <sup>1</sup> / <sub>2</sub> inch.
Front	Band iron		No. 9.
Screws			No. 8.
Fifth wheel bolts	Norway iron		3 <sup>1</sup> / <sub>2</sub> inch.
Perch bolts	Norway iron		7 <sup>1</sup> / <sub>2</sub> inch.

# No. 10.

**Table of Kinds and Sizes of Iron Used in Constructing a light Six Passenger Rockaway, Perch Carriage, 4 feet, 10 inch Track.**

Sectional Parts.	Metal.	Shape.	Size.
Axles, nut.....	Case hardened.....	Plain taper.....	$1\frac{1}{2} \times 7$ inches.
Piece part, front.....	Low Moor iron.....	Square.....	$1\frac{1}{2} \times 1$ inches.
Piece part, back.....	Low Moor iron.....	Square.....	$1\frac{1}{2} \times 1\frac{1}{8}$ inches.
Springs, front, 5 plates.....			$1\frac{1}{2}$ inches.
Length.....			38 inches.
Open.....			7 inches.
Main and second plates.....	Swedes steel, oil temper.	Full elliptic; button heads; top plates, oval points; bottom plates, round points.	No. 2.
Remaining plates.....			No. 3.
Back, 5 plates.....			$1\frac{1}{4}$ inches.
Length.....			40 inches.
Open.....			10 inches.
Main, second and third plates.....			No. 2.
Remaining plates.....			No. 3.
Fifth wheel.....	Norway iron.....		15 inches.
Plates.....	Norway iron.....	Half round.....	$1\frac{1}{4}$ inches.
Bolts.....	Norway iron.....		$\frac{1}{8}$ inch.
Shaft irons.....	Burden's iron.....	Swaged.....	$1\frac{3}{8} \times \frac{3}{8}$ inches.
Length front of bar.....			16 inches.
Length on bar.....			12 inches.
Bolts.....	Norway iron.....		$\frac{5}{16}$ inch.
Jacks.....	Norway iron.....	Plain.....	
Heads.....			$1\frac{3}{8}$ inches.
Bolt.....	Norway iron.....		$\frac{1}{2}$ inch.
Pole stays.....	Refined.....	Oval.....	$3\frac{1}{4} \times \frac{1}{8}$ inch.
Tie plate.....	Norway iron.....		$\frac{3}{8}$ inch thick.
Top plate.....	Norway iron.....	Half oval.....	$\frac{1}{8}$ inch thick.
Main whiffletree bolt.....	Norway iron.....		$\frac{1}{8}$ inch.
Other whiffletree bolts.....	Norway iron.....	T heads.....	$\frac{3}{8}$ inch.
Perch plate, end.....	Norway iron.....	Flat.....	$1\frac{3}{8} \times \frac{3}{8}$ inch.
Center part.....	Burden's iron.....	Swaged.....	$1\frac{3}{8} \times \frac{3}{8}$ inch.
Head plate.....	Norway iron.....		$1\frac{1}{2} \times \frac{1}{4}$ inches.
Bolts.....	Norway iron.....		$\frac{1}{8}$ inch.
Side stays, outer branches.....	Low Moor iron.....	Oval.....	$3\frac{1}{4} \times \frac{1}{8}$ inch.
Inner branches.....	Low Moor iron.....	Oval.....	$3\frac{1}{4} \times \frac{3}{8}$ inch.
Front branches.....	Low Moor iron.....	Oval.....	$3\frac{1}{4} \times \frac{1}{8}$ inch.
Ends at head block.....	Norway iron.....	Half oval.....	$1\frac{3}{8} \times \frac{1}{4}$ inch.
Heels.....	Norway iron.....	Half oval.....	$1\frac{3}{8} \times \frac{1}{4}$ inches.
Bolts.....	Norway iron.....		$\frac{1}{4}$ inch.
Body loops.....	Low Moor iron.....	Swaged.....	$1\frac{4}{8} \times \frac{1}{4}$ inches.
Heads.....		Turned.....	$\frac{1}{8}$ inches.
Bolts.....	Norway iron.....		$\frac{1}{8}$ inches.
Clip king bolt.....	Norway iron.....		$\frac{1}{8}$ inches.
Bolt portion below spring.....			$\frac{7}{8}$ inch.
Bolt portion through spring.....			$\frac{1}{8}$ inch.
Clips.....	Norway iron.....		$\frac{1}{8}$ inches.
Bolt portion.....			$\frac{1}{8}$ inch.
Tire.....	Common iron.....		$1\frac{1}{4} \times \frac{3}{8}$ inches.
Tire.....	Compound iron.....		$1\frac{1}{4} \times \frac{5}{8}$ inches.
Tire.....	Steel.....		$1\frac{1}{4} \times \frac{1}{4}$ inches.
Bolts.....	Norway iron.....		$\frac{1}{4}$ inch.
Step pad without covers.....	Norway iron.....	Square.....	$7 \times 8 \frac{1}{2}$ inches.
Main branch.....	Burden's iron.....	Octagon and square.....	$\frac{7}{8}$ inch.
At pad.....		Oval.....	$1\frac{1}{8} \times \frac{3}{4}$ inches.
Pad, if cover is used.....	Sleek iron, No. 10.....	Horseshoe.....	$6 \times 7 \frac{1}{2}$ inches.
Cover.....	Sheet iron, No. 14.....	Horseshoe.....	$7 \times 8 \frac{1}{2}$ inch.
Back stays.....	Burden's iron.....	Oval.....	$3\frac{1}{8} \times \frac{3}{4}$ inch.
Bolts.....	Norway iron.....		$\frac{3}{8}$ inch.
Dash.....			16 inches high.
Bars.....	Low Moor Iron.....	Oval.....	$3\frac{1}{4} \times \frac{1}{8}$ inch.
Foot rod.....	Burden's iron.....	Oval.....	$3\frac{1}{4} \times \frac{1}{8}$ inch.
Front side rails.....	Burden's iron.....	Round.....	$\frac{1}{8}$ inch.
Arch plates.....	Burden's iron.....	Half oval.....	$7 \times \frac{1}{4}$ inch.
Screws.....			$\frac{7}{8}$ inch No. 11.

## ACID TEST FOR IRON AND STEEL.

To test metal, first clean and polish the piece on all sides, then place it in diluted nitric or sulphuric acid for twenty-four hours, after which wash and dry it; an examination will show the action of the acid. The best steel will present a frosted appearance, inferior steel will be honeycombed; iron will present a fibrous stricture. If different kinds of iron have been welded together the peculiar characteristics of the fibre of each will be revealed. Gray cast iron shows crystal of graphic carbon, other cast irons have the figures equally well defined, each possessing marked characteristics.

## WELDING COMPOUNDS.

For steel, 2 ounces of copperas, 4 ounces of salt, and 4 lbs. of white sand; mix all well together and use the same as with sand.

Equal parts of pulverized borax and glass may be wet with alcohol and heated to a red heat in a crucible; when cold pulverize finely and use the same as borax.

# No. 11.

Table of the Kinds and Sizes of Iron Used in Constructing a Cabriolet on Two Springs. Track, 4 Feet 8 Inches, or 4 Feet 10 Inches.

Sectional Parts.	Metal.	Shape.	Size.
Axles.	Case hardened iron.	Mail or nut.	11 $\frac{1}{2}$ x 7 inches.
Piece part, front.	Low Moor iron.	Square.	11 $\frac{1}{2}$ x 7 $\frac{1}{2}$ inches.
Piece part, back.	Low Moor iron.	Square.	11 $\frac{1}{2}$ x 1 $\frac{1}{2}$ inches.
Springs, front, 5 plates.			1 $\frac{1}{2}$ inches.
Length.			36 inches.
Open.			10 inches.
Main and second plates.			No. 3.
Additional plates.			No. 4.
Back, 6 plates.	Swedes steel, oil temper.	Elliptics; button heads; point to top plates; oval; bottom plates round.	1 $\frac{1}{2}$ inches.
Length.			39 inches.
Open.			11 $\frac{1}{2}$ inches.
Main, 2d and 3d plates.			No. 3.
Additional plates.			No. 4.
If child seat used, front 5 plates.			1 $\frac{1}{2}$ inches.
Fifth wheel.	Norway iron.	Half round.	16 inches.
Plates.	Norway iron.		11 $\frac{1}{2}$ x 3 $\frac{1}{2}$ inches.
Bolt ends.	Norway iron.		$\frac{3}{8}$ inch.
Bolts.			$\frac{5}{16}$ inch.
Shaft iron.	Burden's iron.	Swaged.	1 $\frac{3}{4}$ x 5 $\frac{1}{2}$ inches.
Length on bar.			12 inches.
Length front of bar.			15 inches.
Bolts.	Norway iron.		$\frac{5}{16}$ inch.
Whiffle-tree bolt.	Norway iron.	T head.	$\frac{3}{8}$ inch.
Jack clips.	Norway iron.	Plain.	
Heads.			1 $\frac{1}{4}$ inches.
Bolts.	Norway iron.		$\frac{7}{16}$ inch.
Bolt ends to clip.	Norway iron.		$\frac{7}{16}$ inch.
Perch plate, fifth wheel end.	Norway iron.	Flat.	1 $\frac{1}{4}$ x 3 $\frac{1}{2}$ inches.
Back end.	Norway iron.	Swaged.	1 $\frac{1}{4}$ x 3 $\frac{1}{2}$ inches.
Center part.	Burden's iron.	Half oval.	1 $\frac{1}{4}$ x 5 $\frac{1}{2}$ inches.
Top plate ends.	Norway iron.	Half oval.	1 $\frac{1}{8}$ x 4 $\frac{1}{2}$ inches.
Center part.	Burden's iron.	Half oval.	1 $\frac{1}{8}$ x 4 $\frac{1}{2}$ inches.
Bolts.	Norway iron.		$\frac{5}{16}$ inch.
Head plate.	Norway iron.	Flat.	1 $\frac{1}{4}$ x 3 $\frac{1}{2}$ inch.
Side stays, back branches.	Burden's iron.	Oval.	8 x 1 $\frac{1}{2}$ inch.
Outside front branches.	Burden's iron.	Oval.	8 x 1 $\frac{1}{2}$ inch.
Inside front branches.	Burden's iron.	Oval.	3 $\frac{1}{4}$ x 3 $\frac{1}{2}$ inch.
Bolts.	Norway iron.		1 $\frac{1}{4}$ inch.
Main front bolt.	Norway iron.		$\frac{3}{8}$ inch.
Back bolt.	Norway iron.		$\frac{1}{2}$ inch;
Body loops.	Low Moor iron.	Full oval.	1 $\frac{1}{8}$ inches.
Heads, deep.			1 inch.
Bolts.	Norway iron.		$\frac{3}{8}$ inch.
Bolts for front end.	Norway iron.		$\frac{1}{2}$ inch.
Clip king bolt.	Norway iron.		$\frac{1}{2}$ inch.
Bolt end.			$\frac{3}{8}$ inch.
King bolt at head plate.		Tapered.	3 $\frac{1}{2}$ to 1 $\frac{1}{2}$ inch.
Tire.	Steel.		1 $\frac{1}{8}$ x 5 $\frac{1}{2}$ inches.
Tire.	Common iron.		1 $\frac{1}{4}$ x 5 $\frac{1}{2}$ inches.
Bolts.	Norway iron.	Tire.	1 $\frac{1}{4}$ inch.
Step pads.	Sheet iron.	Square.	6 x 10 inches.
Shank.	Ulster iron.	Octagon and round.	7 x 7 $\frac{1}{2}$ inch.
Step on front axle pad.	Sheet iron.	Square.	4 x 12 $\frac{1}{2}$ inches.
Shank.	Low Moor iron.	Square.	3 $\frac{1}{4}$ inch.
Dash.			1 $\frac{1}{4}$ inches high.
Outside and bottom bars.	Low Moor iron.	Oval.	5 $\frac{1}{2}$ x 3 $\frac{1}{2}$ inch.
Center and top bar.	Low Moor iron.	Oval.	5 $\frac{1}{2}$ x 5 $\frac{1}{2}$ inch.
Bolts.	Norway iron.		$\frac{5}{16}$ inch.
Seat rail.		Round.	$\frac{1}{2}$ inch.
Stump joints, back.	Norway iron.		4 $\frac{1}{2}$ x 5 $\frac{1}{2}$ inch.
Piece.	Low Moor iron.	Oval.	3 $\frac{1}{2}$ x 7 $\frac{1}{2}$ inch.
Front.	Norway iron.	Oval.	3 $\frac{1}{2}$ x 5 $\frac{1}{2}$ inch.
Piece.	Low Moor iron.	Oval.	5 $\frac{1}{2}$ x 3 $\frac{1}{2}$ inch.
Wings, outside bars.		Oval.	5 $\frac{1}{2}$ x 3 $\frac{1}{2}$ inch.
Inside bars.		Oval.	5 $\frac{1}{2}$ x 5 $\frac{1}{2}$ inch.
Rocker plates, at neck.	L. W. iron.	Flat.	2 x 2 $\frac{1}{2}$ inches.
At ends.			2 x 3 $\frac{1}{2}$ inches.
Screws.			No. 16.
Pole irons, goose necks.	Norway iron.	Round.	$\frac{3}{4}$ inch.
Bottom plate on pole.	Norway iron.	Half oval.	11 $\frac{1}{2}$ x 7 $\frac{1}{2}$ inch.
On bar.	Norway iron.	Half oval.	7 x 7 $\frac{1}{2}$ inch.
Top plate.	Norway iron.	Half oval.	6 x 7 $\frac{1}{2}$ inch.
Side stays, outside.	Burden's iron.	Oval.	6 x 7 $\frac{1}{2}$ inch.
Inside.	Burden's iron.	Oval.	3 $\frac{1}{2}$ x 3 $\frac{1}{2}$ inch.
Bolts.	Norway iron.		$\frac{5}{16}$ inch.
Whiffle-tree bolts.	Norway iron.		$\frac{3}{8}$ inch.
Evener bolt.	Norway iron.		$\frac{7}{16}$ inch.

## ANNEALING STEEL.

Steel, whether crucible or other, can be annealed by heating it to a bright red and plunging it into hot water; the water must be at a boiling point. Steel annealed this way is harder than when annealed in the ordinary manner, but it is much tougher. When the steel is put into the water it does not cool quickly and the uniform heat which slowly diminishes tempers the metal.

# No. 12.

Table of Kinds and Sizes of Iron Used in Ironing a Victoria on Platform Springs; 4 feet 8 or 4 feet 10-inch Track.

Sectional Parts.	Metal.	Shape.	Size.
Axles.	Case hardened.	Nut or nail.	1 $\frac{1}{4}$ x 7 $\frac{1}{2}$ inches.
Piece part.	Low Moor iron.		1 $\frac{3}{8}$ inches.
Springs.			1 $\frac{1}{2}$ inches.
Front.			3 plates.
Length.			30 inches.
Open.			6 inches.
Main and second plates.			No. 3.
Additional plates.			No. 4.
Back.			4 plates.
Length.	Swedes steel.	Elliptic oval point	36 in. hex.
Open.		top plates, square ends	7 inches.
Main plate.		on bottom plates, button heads.	No. 2.
Additional plates.			No. 3.
With cross spring, the main and 2d plates.			No. 3.
Additional plates.			No. 4.
Cross spring.			4 plates.
Main and second plates.			No. 2.
Additional plates.			No. 3.
Fifth wheel.	Burden's iron.		1 $\frac{1}{2}$ x 3 $\frac{1}{8}$ inches.
Top plate of top bed.	Norway iron.	Half round.	7 $\frac{1}{2}$ x 1 $\frac{1}{2}$ inch.
Bottom bed bottom plate.	Ulster iron.	Full half round.	1 $\frac{1}{4}$ x 5 $\frac{1}{8}$ inches.
Bottom bed top plate.	Ulster iron.	Half oval.	5 $\frac{1}{8}$ x 3 $\frac{1}{8}$ inch.
Back bar, top carriage.	Low Moor iron.	Oval.	1 $\frac{1}{8}$ x 8 inch.
Bottom socket.	Norway iron.	Oval.	1 $\frac{1}{4}$ x 4 inch.
Side stays at spring bearing.	Ulster iron.	Flat.	1 $\frac{1}{2}$ x 3 $\frac{1}{8}$ inch.
Front end.	Ulster iron.	Round.	3 $\frac{1}{4}$ x 1 $\frac{1}{2}$ inch.
Back end.	Ulster iron.	Round.	3 $\frac{1}{4}$ inch.
Bottom plates to futchels.	Burden's iron.	Square.	3 $\frac{1}{4}$ inch.
Front end.	Burden's iron.	Half oval.	1 $\frac{1}{4}$ x 3 $\frac{1}{8}$ inch.
Buck end.	Burden's iron.	Half oval.	3 $\frac{1}{4}$ x 1 $\frac{1}{2}$ inch.
Inside plate to futchels.		Half oval.	1 $\frac{1}{4}$ x 1 $\frac{1}{2}$ inch.
Top plate of top bed at center.	Ulster iron.	Swaged.	1 $\frac{1}{4}$ x 1 $\frac{1}{2}$ inch.
Ends.		Flat.	3 $\frac{1}{4}$ x 1 $\frac{1}{2}$ inch.
King bolt.	Norway iron.		3 $\frac{1}{8}$ inch.
Outside trace steps or knobs.	Norway iron.	Oblong.	2 $\frac{3}{8}$ inches.
Inside trace steps or knobs.	Norway iron.	Round.	2 inches.
Bolt.	Norway iron.		3 $\frac{1}{8}$ inch.
Box clips.	Norway iron.		1 $\frac{1}{2}$ x 3 $\frac{1}{8}$ inch.
Securing clips.	Norway iron.		5 $\frac{1}{8}$ x 3 $\frac{1}{8}$ inch.
Ends.			3 $\frac{1}{8}$ inch.
Bolts for inside plates of futchels.	Norway iron.		3 $\frac{1}{8}$ inch.
Other bolts.	Norway iron.		3 $\frac{1}{8}$ inch.
Draw bar plate.	Norway iron.	Half oval.	1 $\frac{1}{4}$ x 1 $\frac{1}{2}$ inches.
Plates for wooden brakes.	Low Moor iron.	Swaged, half round.	1 $\frac{1}{8}$ x 5 $\frac{1}{8}$ inches.
Iron brakes.	Burden's iron.	Square.	1 $\frac{1}{4}$ x 1 $\frac{1}{4}$ inches.
At back shoulder.		Swaged.	1 $\frac{1}{8}$ x 1 inches.
Bolts for back end.	Norway iron.		3 $\frac{1}{8}$ inch.
Front loop, butts.	Low Moor iron.	Square.	1 $\frac{1}{4}$ inch.
Bolts.			3 $\frac{1}{8}$ inch.
Front ends.		Oval.	1 $\frac{1}{8}$ x 4 inch.
Bolts.			3 $\frac{1}{8}$ inch.
Step pad.	Sheet iron.		No. 10.
Pad.			6 $\frac{1}{2}$ x 10 inches.
Step shank.	Ulster iron.	Octagon and round.	7 $\frac{1}{2}$ inch.
Wings, inside bars.	Low Moor iron.	Oval.	5 $\frac{1}{8}$ x 3 $\frac{1}{8}$ inch.
Other bars.	Low Moor iron.	Oval.	5 $\frac{1}{8}$ x 3 $\frac{1}{8}$ inch.
Securing bolts.		Countersunk.	3 $\frac{1}{8}$ inch.
Tire.	Steel.		1 $\frac{1}{8}$ x 4 inches.
Tire.	Compound.		1 $\frac{1}{8}$ x 5 $\frac{1}{8}$ inch.
Tire.	Iron.		1 $\frac{1}{8}$ x 3 $\frac{1}{8}$ inches.
Bolts.	Norway iron.		1 $\frac{1}{4}$ inch.
Hub bands (thick).	Band iron.	Plain; jagged.	3 $\frac{1}{8}$ inch.
Steps for top carriage.	Sheet iron.		No. 10 4 x 4 $\frac{1}{2}$ in
Shaft plates to crook.			
Ends.		Half oval.	1 $\frac{1}{8}$ x 5 $\frac{1}{8}$ inch.
Screw.			3 $\frac{1}{4}$ inch No. 10.
Bolts for back end.	Norway iron.		1 $\frac{1}{4}$ inch.
Draft bolts.	Norway iron.		3 $\frac{1}{8}$ inch.
Dash, hight.			1 $\frac{1}{2}$ inches.
Handles.			2 $\frac{1}{2}$ inches.
Main and bottom bars.	Low Moor iron.	Oval.	3 $\frac{1}{4}$ x 3 $\frac{1}{8}$ inch.
Additional rails.	Low Moor iron.	Oval.	5 $\frac{1}{8}$ x 3 $\frac{1}{8}$ inch.
Front seat rail.	Ulster iron.	Round.	1 $\frac{1}{8}$ x 6 inches.
Hight, front back.			6 inches.
Bracket plates.	Common iron.	Half oval.	1 $\frac{1}{4}$ x 1 $\frac{1}{4}$ inches.
Back joints.		Stump joints.	7 $\frac{1}{2}$ x 5 $\frac{1}{8}$ inch.
Piece part.	Norway iron.	Oval.	5 $\frac{1}{8}$ x 1 $\frac{1}{2}$ inch.
Front joints.		Stump joints.	3 $\frac{1}{4}$ x 2 inches.
Piece part.	Norway iron.	Oval.	5 $\frac{1}{8}$ x 7 $\frac{1}{8}$ inch.
Plate for front bow.	Band iron.		1 $\frac{1}{8}$ x 8 inch.
Rocker plates.	L. W. iron.		2 $\frac{1}{2}$ x 3 $\frac{1}{8}$ inches.
Screws.			No. 18.

# No. 13.

**Table of Kinds and Sizes of Iron Used in Constructing a Victoria on C Springs, 4 Feet 8 Inch or 4 Feet 10 Inch Track.**

Sectional Parts.	Metal.	Shape.	Size.
Axles.	Case hardened	Collinge	$1\frac{1}{4} \times 7\frac{1}{2}$ inches.
Piece part.	Low Moor iron		$1\frac{3}{8}$ inches.
Springs.			$1\frac{3}{4}$ inches.
Front			5 plates.
Length			40 inches.
Open			$11\frac{1}{2}$ inches.
Main plate.			No. 2.
Second and third plates.			No. 3.
Fourth, fifth and sixth.			No. 4.
Back.			5 plates.
Length			38 inches.
Open			10 inches.
Main, second and third plates.			No. 2.
Fourth and fifth plates.			No. 3.
C springs.			6 plates.
First, second and third plates.			No. 2.
Fourth, fifth and sixth.			(No. 3.
Fifth wheel		Full circle.	26 inches.
Bottom section.	Burden's iron.	Flat	$1\frac{3}{8} \times 3\frac{1}{8}$ inches.
Top section.	Burden's iron.	Half oval.	$1\frac{3}{8} \times 3\frac{1}{8}$ inches.
Molding		Half round	$2\frac{1}{2} \times \frac{3}{8}$ inch.
Hook	Norway iron.		
Bottom bed, bottom plate.	Burden's iron.	Full half round.	$1\frac{3}{8} \times 3\frac{1}{8}$ inches.
Bottom bed, top plate.	Burden's iron.	Half oval.	$1\frac{1}{8} \times 3\frac{1}{8}$ inch.
Top bed, bottom plate.	Norway iron.	Flat half oval.	$1\frac{5}{8} \times 3\frac{1}{8}$ inches.
Top bed, top plate, center.	Norway iron.		$1\frac{3}{8} \times 1\frac{1}{2}$ inches.
Ends			$1\frac{1}{8} \times \frac{1}{16}$ inch.
Bottom plates of futchels, front.	Burden's iron.		$\frac{5}{8}$ inch thick.
Center	Burden's iron.	Square	1 inch.
Ends		Full oval	$1\frac{3}{4}$ inch.
Edge		Flat	$\frac{1}{8}$ inch.
Back support to futchel.			$\frac{3}{4}$ inch thick.
Ends tapered to			$\frac{1}{16}$ inch.
Jaw plates.		Band iron	No. 10.
Side stay at spring bearing.	Low Moor iron.	Round	$1\frac{3}{4} \times 5\frac{1}{8}$ inches.
Ends	Low Moor iron.		$\frac{7}{8}$ inch.
Tapered to			$\frac{5}{8}$ inch.
At the futchels.			$1\frac{1}{8} \times \frac{1}{16}$ inch.
At the front end.	Norway iron.	Swaged	$\frac{3}{8}$ inch.
Collars		Solid	1 inch.
King bolt	Norway iron.		$\frac{3}{4}$ inch.
Frog or socket arms.	Norway iron.	Oval	$1\frac{1}{4} \times \frac{1}{4}$ inch.
Evener bar bolt.	Norway iron.		$\frac{5}{8}$ inch.
Bearing plate			$\frac{1}{2}$ inch thick.
Bottom plate	Band iron.		No. 8.
Strap loops			$1\frac{1}{4} \times 1\frac{1}{2}$ inches.
Pole bridge.	Burden's iron.		$1\frac{3}{4} \times 1\frac{1}{4}$ inches.
Box clips.	Norway iron.		$1\frac{3}{4} \times 1\frac{1}{16}$ inches.
Securing clips.	Norway iron.	Flat	$\frac{5}{8} \times 1\frac{1}{2}$ inch.
Ends			$\frac{1}{2}$ inch.
Clip bars	Horseshoe iron.	Flat	$\frac{7}{8} \times 1\frac{1}{2}$ inch.
Back bar, front carriage.	Norway iron.		$1\frac{3}{4} \times 4\frac{1}{4}$ inches.
Arms from elliptic to body.	Low Moor iron.	Full oval	$1\frac{1}{2} \times 1$ inches.
Back loops at butt	Low Moor iron.	Square	$1\frac{1}{2}$ inches.
Back end.		Half oval.	$1\frac{1}{4}$ inches.
Edge			$\frac{3}{8}$ inch.
Jacks for spring arms.	Norway iron.		$1\frac{3}{4} \times 3\frac{1}{8}$ inches.
Bolts	Norway iron.		$\frac{5}{8}$ inch.
Step pad.	Norway iron.	Grate	$7 \times 9$ inches.
Step shank.	Burden's iron.	Oval	$\frac{7}{8}$ inch.
Joints			$\frac{5}{8}$ inch.
Tire	Compound iron.		$1\frac{5}{8} \times 1\frac{1}{16}$ inches.
Tire	Low Moor iron.		$1\frac{5}{8} \times 1\frac{1}{16}$ inches.
Tire	Common iron		$1\frac{5}{8} \times 3\frac{1}{8}$ inches.
Bolts		Tire	$\frac{5}{8}$ inch.
Hub bands, back	Band iron		No. 8.
Front	Band iron		No. 9.
Rocker plates.	Common iron		$3\frac{1}{2} \times 1\frac{1}{2}$ inches.
Or of.	Low Moor iron.		$3\frac{1}{2} \times 1\frac{1}{16}$ inches.
Screws			No. 20.
Stump joints.			$1\frac{1}{8} \times \frac{3}{8}$ inch.
Piece part.			$\frac{7}{8} \times 3\frac{1}{8}$ inch.
Toe board plate.		Oval.	
Seat rail, single seat.	Burden's iron.	Half oval.	$1\frac{3}{4} \times 3\frac{1}{4}$ inches.
Double seat.	Burden's iron.	Round.	$\frac{9}{16}$ inch.
Front stay.	Norway iron.	Round.	$1\frac{1}{2}$ inch.
Wings, inside bars.	Common iron.	Oval.	$1\frac{4}{5} \times \frac{7}{8}$ inch.
Outer bar.	Common iron.	Oval.	$3\frac{1}{2} \times \frac{3}{8}$ inch.
Bolts for securing front carriage.	Norway iron.	Oval.	$\frac{5}{8} \times 3\frac{1}{8}$ inch.
Screws			No. 14.
Body bolts.	Norway iron.		$\frac{7}{8}$ inch.
Step bolts.	Norway iron.		$\frac{3}{8}$ inch.
Loop bolts.	Norway iron.		$\frac{3}{8}$ inch.
Bolts for securing C spring.	Norway iron.		$\frac{7}{16}$ and $3\frac{1}{8}$ inch.

# No. 14.

**Table of Kinds and Sizes of Iron Used in Constructing a Light Coupe; Front Track, 3 Feet 6**

**Inches; Back Track, 4 Feet 2 Inches.**

Sectional Parts.	Metal.	Shape.	Size.
Axles.			
Piece part.	Case hardened iron.	Nut or nail.	$1\frac{1}{2} \times 7$ inches.
Springs.	Low Moor iron.	Bar.	$1\frac{3}{8}$ inches.
Front.			$1\frac{1}{2}$ inches.
Length.		Top plates thin, square ends; button ends beveled and square;	36 inches.
Open.		beveled and square; button heads. If the back spring is placed on the back axle, it is but 7 inches open.	9 inches.
Main plate.			No. 2.
Second plate.			No. 3.
Third and fourth plates.	Best quality Swedish steel, oil temper.		No. 4.
Back.			4 plates.
Length.			38 inches.
Open.			$9\frac{1}{2}$ inches.
Main and second plates.			No. 2.
Third plate.			No. 3.
Fourth plate.			No. 4.
Fifth wheel.	Norway iron.	Half circle.	20 inches.
Plates.			$1\frac{1}{8} \times \frac{3}{8}$ inches.
Bottom bed, bottom plate.	Burden's iron.	Full half oval.	$1\frac{3}{8} \times \frac{3}{8}$ inches.
Bottom bed, top plate.	Burden's iron.	Half oval.	$1x\frac{3}{8}$ inch.
Bottom plate of futchels.	Burden's iron.	Square.	$\frac{3}{4}$ inch.
Either side of concave.		Half oval.	$\frac{7}{8} \times \frac{1}{2}$ inch.
Back end.	Norway iron.	Half oval.	$3\frac{1}{4} \times \frac{1}{2}$ inch.
Front end.	Norway iron.	Half oval.	$1\frac{1}{8} \times \frac{3}{8}$ inches.
Side stay at spring bearing.	Burden's iron.		$1\frac{1}{2} \times \frac{3}{8}$ inches.
Length.		Oval.	$\frac{5}{2}$ inches.
Front end.		Oval.	$7\frac{1}{8} \times \frac{3}{8}$ inch.
Back end.		Oval.	$3\frac{1}{4} \times 1\frac{1}{2}$ inch.
Shatt jaw.	Norway iron.	Half oval.	$1\frac{1}{2} \times \frac{3}{2}$ inches.
Inside plate to futchel.	Norway iron.	Half oval.	$1\frac{1}{8} \times \frac{3}{8}$ inches.
End at outside stay.	Norway iron.	Half oval.	$1\frac{1}{4} \times 3\frac{1}{8}$ inches.
Bolts.	Norway iron.		$\frac{3}{8}$ inch.
Socket plate.	Norway iron.	Full half oval.	$1\frac{1}{4} \times \frac{3}{8}$ inches.
Top plate of top bed.	Burden's iron.	Full half round.	$1\frac{1}{8} \times \frac{3}{8}$ inches.
Ends.			$\frac{7}{8} \times \frac{1}{2}$ inch.
Top futchel plates.	Burden's iron.	Half oval.	$\frac{7}{8} \times \frac{1}{2}$ inch.
King bolt.	Norway iron.	Plain pattern.	$\frac{3}{8}$ inch.
Bottom socket for king bolt.	Norway iron.	Oval.	$1x\frac{3}{4}$ inch.
Ends.			$1x\frac{3}{8}$ inch.
Pole socket, diameter.	Ulster iron.		$1\frac{1}{4}$ inch.
Length.			$1\frac{1}{2}$ inch.
Draw bar pole socket.			$2\frac{3}{8} \times 2\frac{1}{8}$ inches.
Bottom plate.	Norway iron.		$1\frac{3}{8} \times \frac{7}{8}$ inches.
Trace knobs.	Ulster iron.	Round.	$2\frac{1}{8}$ inches.
Bolt part.			$\frac{3}{8}$ inch.
Bottom plate to shafts.		Half oval.	$1x\frac{3}{8}$ inches.
Crook portion.	Norway iron.		$3\frac{1}{4} \times \frac{3}{8}$ inch.
Bolts.			$\frac{1}{4}$ inch.
Screws.			No. 14, 1 inch.
Draft bolts.	Norway iron.		$\frac{1}{4}$ inch.
Tire.	Steel.		$1\frac{1}{4} \times \frac{1}{8}$ inches.
Tire.	Common iron.		$1\frac{1}{4} \times \frac{3}{8}$ inches.
Tire.	Iron.		$1\frac{1}{4} \times \frac{1}{4}$ inches.
Bolts.	Norway iron.	Tire.	$\frac{1}{4}$ inch.
Back band to hubs.			$\frac{3}{8}$ inch thick.
Front band to hubs.			$\frac{5}{8}$ inch thick.
Rocker plate at arch.	L. W. iron.		$3x\frac{1}{2}$ inches.
Ends.			$3x\frac{3}{8}$ inches.
Dash.			13 inches high.
Side and bottom bars.	Burden's iron.	Oval.	$3\frac{1}{4} \times \frac{3}{8}$ inch.
Center and top bars.	Burden's iron.	Oval.	$3\frac{1}{4} \times \frac{5}{8}$ inch.
Seat rail.	Ulster iron.	Round.	$\frac{1}{6}$ inch.
Plates for wood brakes.	Burden's iron.	Half round.	$1\frac{1}{8} \times \frac{3}{8}$ inches.
Bolts.	Norway iron.		$\frac{1}{4}$ inch.
Step pads.	Sheet iron, No. 10.	Horseshoe.	$5\frac{3}{4} \times 7$ inches.
Shank.	Ulster iron.	Octagon and round.	$7\frac{1}{4} \times \frac{7}{8}$ inch.
At pad.		Round.	$\frac{3}{8}$ inch.
Bolts.			$\frac{1}{4}$ inch.
Cover.	Sheet iron.		No. 14.
Shank.	Norway iron.	Octagon and round.	$7\frac{1}{4} \times \frac{9}{16}$ inch.
At cover.			$\frac{1}{6}$ inch.
Flange to cover.	Norway band iron.	Oval.	$1\frac{1}{8} \times \frac{5}{8}$ inch.
Fender.	Burden's iron.	Oval.	$5\frac{1}{8} \times \frac{7}{8}$ inch.
Width.			5 inches.

## TO CASE-HARDEN IRON.

Heat the iron to a cherry red and sprinkle it well with prussiate of potash, using a coarse pepper box, cover all parts thoroughly, put the iron back into the fire and heat it red, then plunge it into cold water, being careful to hold the piece perpendicular to prevent springing.

# No. 15.

**Table of the Kinds and Sizes of Iron Used in Constructing a Brougham Platform Carriage;**

**Track, 4 Feet 6 Inches, and 4 Feet 10 Inches.**

Sectional Parts.	Metal.	Shape.	Size.
Axes.	Case hardened iron.	Nut or mail.	$1\frac{1}{4} \times 7\frac{1}{2}$ inches.
Piece part.	Low Moor iron.		$\frac{3}{8}$ inch.
Front.			$1\frac{1}{2}$ inch.
Length.			4 plates.
Open.			36 inches.
First and second plates.			10 inches.
Third plate.			No. 2.
Fourth plate.			No. 3.
Back.			No. 4.
Length.			4 plates.
Open.			38 inches.
First plate.	First-quality steel.	front with combination cross spring	$8\frac{1}{2}$ inches.
Second plate.		back, button heads,	No. 2.
Third and fourth plates.		oval ends to plates.	No. 3.
Cross spring.			No. 4.
Length.			4 plates.
Rise.			38 inches.
First plate.			$3\frac{1}{2}$ inches.
Second and third plates.			No. 2.
Fourth plate.			No. 3.
Fifth wheel.	Burden's iron.	Half circle.	$22$ inches.
Top plates.		Half round.	$1\frac{1}{8} \times \frac{3}{8}$ inch.
Bottom plates.		Flat.	$1\frac{1}{8} \times \frac{3}{8}$ inch.
Bottom bed, bottom plate.	Burden's iron.	Full half round.	$1\frac{3}{8} \times \frac{3}{8}$ inch.
Top bed, top plate.	Norway iron.	Half oval.	$1\frac{1}{4} \times 1\frac{1}{2}$ inch.
Bottom bed, top plate.	Burden's iron.	Half oval.	$1\frac{3}{8} \times \frac{3}{8}$ inch.
Top bed, bottom plate.	Norway iron.	Flat half oval.	$1\frac{1}{4} \times \frac{3}{8}$ inch.
Futchel side stays.	Ulster iron.		$1\frac{1}{2} \times \frac{3}{8}$ inch.
Spring bearing.			6 inches long.
Front piece.	Ulster iron.	Round.	$\frac{3}{8}$ inch.
End.			$\frac{3}{16}$ inch.
Futchel plate.	Norway iron.		$1\frac{1}{2}$ inch.
Back piece.	Ulster iron.	Round.	$\frac{3}{8}$ inch.
End.			$\frac{3}{16}$ inch.
Bearing.			$\frac{7}{8} \times \frac{1}{16}$ inch.
Bottom plates of futchels, center.	Burden's iron.	Full oval.	$\frac{3}{4}$ and $\frac{7}{8}$ inch.
Piece, back.	Burden's iron.		$\frac{3}{8} \times \frac{1}{2}$ inch.
Piece, front.	Burden's iron.	Chamfer edges.	$\frac{3}{8}$ inch thick.
Jaw plates.	Band iron.		No. 10.
King bolt.	Norway iron.		$\frac{3}{8}$ inch.
Pole bridge.	Ulster iron.		$1\frac{3}{8} \times \frac{3}{4}$ inch.
Pole stop.	Ulster iron.		$3\frac{1}{4} \times \frac{1}{2}$ inch.
Pole hook.	Norway iron.		$\frac{3}{8}$ inch bolt end.
Bottom plate evener bar.	Band iron.		No. 10.
Evener bar king bolt.	Norway iron.		$\frac{1}{2}$ inch.
King bolt plate.	Ulster iron.		$\frac{7}{8}$ inch.
King bolt stay.	Norway iron.	Round.	$\frac{1}{2}$ inch.
Socket plate.	Norway iron.	Oval.	$1\frac{1}{8} \times \frac{3}{8}$ inch.
Bottom plate of futchel.		Half oval.	$\frac{7}{8}$ inch.
Axle clips.	Norway iron.		$1\frac{1}{2} \times \frac{3}{8}$ inch.
Securing clips.	Norway iron.	Swaged half round.	$5\frac{1}{8} \times \frac{3}{8}$ inch.
Bolt ends.	Norway iron.		$\frac{3}{8}$ inch.
Bolts.			$\frac{5}{16}$ inch.
Tire.	Low Moor iron.		$1\frac{3}{8} \times \frac{5}{16}$ inch.
Tire.	Steel.		$1\frac{1}{4} \times \frac{3}{4}$ inch.
Bolts.	Norway iron.	Tire.	$\frac{1}{4}$ inch.
Front hub bands.	Band iron.		$\frac{5}{16}$ inch thick.
Pocker plates at neck.	L. W.		$2\frac{1}{2} \times \frac{1}{2}$ inch.
Ends.			$2\frac{1}{2} \times \frac{3}{8}$ inch.
Screws.			No. 18.
Dash.			
Outside and bottom bars.		Oval.	$\frac{5}{8} \times \frac{3}{8}$ inch.
Top and center bars.	Norway iron.	Oval.	$\frac{5}{8} \times \frac{1}{2}$ inch.
Heels.			$1\frac{1}{2} \times \frac{1}{2}$ inch.
Lamp props.	Norway iron.	Round.	$\frac{3}{8}$ inch.
Iron brake.	Burden's iron.	Square.	$\frac{1}{4}$ inch.
Body portion.		Half round.	$1\frac{1}{4}$ inch.
Extension taper to.		Oval.	$1\frac{1}{8}$ inch.
Bolts for dash, brakes and steps.	Norway iron.		$\frac{5}{16}$ inch.
Bolts, body.	Norway iron.		$\frac{3}{8}$ inch.
Top back bar to front carriage.	Burden's iron.	Full oval.	$\frac{1}{4}$ inch.
Cross spring stay.	Burden's iron.		$1\frac{1}{2} \times \frac{3}{8}$ inch.
Spring bearing.			6 inches long.
Steps to front carriage.	Sheet iron.		No. 10.
Pad.			$4 \times 5$ inches.
Body steps.		Horseshoe.	$6\frac{1}{2} \times 7\frac{1}{2}$ inches.
Shank.	Low Moor iron.	Octagon.	$\frac{7}{8}$ inch.
At pad.		Round.	$\frac{5}{8}$ inch.
Step cover.	Sheet iron.		No. 12.
Stay.	Ulster iron.	Square.	$\frac{7}{16}$ inch.
Plate for wooden brake.	Ulster iron.	Thin half oval.	$1\frac{1}{2} \times \frac{5}{8}$ inch.
Spring bearing.		Flat.	6 inches long.

# No. 16.

**Table of Kinds and Sizes of Iron Used in Constructing a Landau on Platform Springs. Track, front 4 feet 6 inches, back 4 feet 10 inches.**

Sectional Parts.	Metal.	Shape.	Size.
Axles.	Case hardened.	Mail or Collinge.	$1\frac{3}{8} \times 8$ inches.
Piece part.	Low Moor iron.		$1\frac{5}{8}$ inches.
Springs.			$1\frac{3}{4}$ inches.
Front.			6 plates.
Length.			40 inches.
Open.			$11\frac{1}{2}$ inches.
Main and second plates.			No. 2.
Third and fourth plates.			No. 3.
Fifth and sixth plates.			No. 4.
Back.			5 plates.
Length.			40 inches.
Open.			$10\frac{1}{2}$ inches.
Main, 2d and 3d plates.			No. 2.
Fourth and 5th plates.			No. 3.
Cross springs.			$1\frac{3}{4}$ inch, 5 plates.
Main, 2d and 3d plates.			No. 2.
Additional plates.			No. 3.
Arch.			$4\frac{1}{8}$ inches.
Fifth wheel.		Full circle.	24 inches.
Plates.	Burden's iron.		$1\frac{3}{8}$ inch.
Upper section.	Burden's iron.	Half oval.	$\frac{7}{8}$ inch thick.
Molding.		Half round.	$\frac{7}{8} \times \frac{3}{8}$ inch.
Hook.	Norway iron.		$1\frac{1}{2}$ inch thick.
Bottom bed, bottom plate.	Burden's iron.	Half round.	$1\frac{3}{4} \times \frac{3}{4}$ inch.
Bottom bed, top plate.	Burden's iron.	Half oval.	$1\frac{1}{4} \times \frac{5}{8}$ inch.
Seat stay at spring bearing.	Burden's iron.		$1\frac{3}{4} \times \frac{3}{4}$ inch.
End pieces.	Burden's iron.	Round.	$\frac{3}{4}$ inch.
At the futchels.			$\frac{3}{8}$ inch.
On the futchels, front.			$1\frac{1}{8} \times \frac{3}{4}$ inch.
Bottom plate of top bed.	Norway iron.	Flat half oval.	$1\frac{1}{2} \times \frac{3}{4}$ inch.
Top plate of top bed.	Norway iron.		$1\frac{1}{4} \times \frac{5}{8}$ inch.
Ends tapered to.			1 inch.
Bottom plate of futchels, front.	Burden's iron.		$\frac{3}{8}$ inch thick.
Tapered to.			$\frac{1}{4}$ inch.
Center piece.	Burden's iron.	Square.	1 inch.
Back end.			$\frac{3}{8}$ inch thick.
Jaw plates to futchels.	Band iron.		$\frac{7}{8}$ inch.
Pole bridge.	Ulster iron.		$1\frac{3}{4} \times \frac{3}{8}$ inch.
Bottom plates of puncheons.	Ulster iron.	Half oval.	$1\frac{1}{8} \times \frac{3}{8}$ inch.
King bolt plate of evener bar.			$1\frac{2}{3}$ inch thick.
Bottom plate of evener bar.	Band iron.		No. 8.
Box clips.	Norway iron.		$1\frac{3}{4} \times \frac{1}{2}$ inch.
Securing clips.	Norway iron.		$3\frac{1}{4} \times \frac{1}{8}$ inch.
Ends.			$\frac{1}{2}$ inch.
Clip bars.	Horseshoe iron.		$\frac{7}{8} \times \frac{1}{2}$ inch.
King bolt.	Norway iron.		$\frac{7}{8}$ inch.
Socket arms.	Norway iron.	Oval.	$1\frac{1}{4} \times \frac{5}{8}$ inch.
Back loops at butts.	Burden's iron.	Square.	$\frac{3}{8}$ inch.
Back ends.		Oval.	$\frac{3}{8}$ inch.
Book step.			10x10 inches.
Backs.	Sheet iron.		No. 14.
Frames.	Ulster iron.		$1\frac{1}{4} \times \frac{3}{8}$ inch.
Front, sheet iron.			No. 12.
Step work.		Round.	$\frac{7}{16}$ inch.
Joints.		Square.	$\frac{7}{16}$ inch.
Horse shoe step.	Sheet iron.		$7\frac{1}{2} \times 8\frac{1}{2}$ inches.
Shanks.	Burden's iron.	Octagon and round.	1 inch.
Step cover.	Sheet iron.		No. 14.
Sides.	Norway iron.		$1x\frac{1}{8}$ inch.
Boot steps.	Norway iron.		$5\frac{1}{2} \times 6$ inches.
Tire.	Low Moor iron.		$1\frac{1}{2} \times \frac{1}{2}$ inch.
Tire.	Steel.		$1\frac{3}{8} \times \frac{3}{8}$ inch.
Tire.	Compound iron.		$1\frac{1}{2} \times \frac{3}{8}$ inch.
Bolts.	Norway iron.	Tire.	14 inch.
Hub hands, front.	Band iron.		No. 9.
Back.	Band iron.		No. 8.
Rocker plates, circular.	L. W. iron.		$3\frac{1}{2} \times \frac{1}{2}$ inch.
Angular.	L. W. iron.		$4 \times \frac{1}{2}$ inch.
Screws.			No. 20.
Joints.	Norway iron.	Stump joints.	$1\frac{1}{8} \times \frac{3}{4}$ inch.
Piece Part.	Low Moor iron.	Oval.	$1x\frac{5}{8}$ inch.
Hinges for center of top.	Norway iron.		$1x\frac{1}{4}$ inch.
Weather plate.	Band iron.		$\frac{3}{8}$ inch.
Stays.		Round.	$2\frac{1}{4} \times \frac{1}{4}$ inch.
Seat rail.		Round.	$\frac{1}{2}$ inch.
Securing bolts.			$\frac{3}{8}$ inch.
Front fender, side and main bars.	Ulster iron.	Oval.	$\frac{7}{8} \times \frac{1}{2}$ inch.
Outer bars.	Ulster iron.	Oval.	$\frac{7}{8} \times \frac{3}{8}$ inch.
Toc board.		Oval.	$1\frac{1}{2} \times 5$ inch.
Screws.			No. 14.
Lamp props at butts.	Norway iron.	Oval.	$\frac{3}{4}$ inch.
Tapered at stem.	Norway iron.		$\frac{5}{8}$ inch.
Break plates.	Burden's iron.	Half round.	$1\frac{3}{4} \times \frac{3}{4}$ inch.
Spring bearings.			6 inches.
Supporting bars, cross springs.	Burden's iron.		$1\frac{3}{4} \times \frac{3}{4}$ inch.
Spring bearings.			6 inches.
Ends.		Oval.	$1\frac{5}{8} \times \frac{3}{8}$ inch.
T's.	Norway iron.	Flat half oval.	$1\frac{1}{2} \times \frac{1}{2}$ inch.
Clips.	Norway iron.		$\frac{7}{8} \times \frac{3}{8}$ inch.
Back bar of front carriage.	Burden's iron.	Oval.	$1\frac{1}{2} \times \frac{3}{8}$ inch.
T's.	Norway iron.	Flat half oval.	$1\frac{1}{4} \times \frac{3}{8}$ inch.

# No. 17.

Tables of Sizes and Kinds of Iron Used in Constructing a Brett. See Springs, 4 feet 8 and 4 feet 10 inch Track.

Sectional Parts.	Metal.	Shape.	Size.
Axle.....	Case hardened iron.	Collinge.....	1 $\frac{3}{8}$ x 8 inches.
Piece part.....	Low Moor iron.....		1 $\frac{1}{2}$ inches.
Springs, elliptic.....			1 $\frac{3}{4}$ inches.
Front.....			5 plates.
Length.....			39 inches.
Open.....			11 inches.
Main and second plates.....			No. 2.
Third and fourth plates.....			No. 3.
Fifth plate.....			No. 4.
Back.....	Swedes steel, oil temper.	Top plates, oval ends; bottom plates, square ends; button heads.	5 plates.
Length.....			36 inches.
Open.....			9 inches.
Main and second plates.....			No. 2.
Fourth and fifth plates.....			No. 3.
C springs.....			1 $\frac{3}{4}$ inches.
Plates.....			Seven.
First, 2d and 3d plates.....			No. 2.
Fourth and fifth plates.....			No. 3.
Sixth and seventh plates.....			No. 4.
Fifth wheel.....	Burden's iron.		1 $\frac{1}{4}$ x 3 $\frac{3}{8}$ inches.
Upper half, if molded.....	Burden's iron.....	Half round.....	5 $\frac{1}{8}$ inch.
Hook, bolt portion.....	Norway iron.....		3 $\frac{3}{8}$ inch.
Bottom bed, bottom plate.....	Burden's iron.....	Full half round.....	1 $\frac{3}{4}$ x 3 $\frac{1}{4}$ inch.
Bottom bed, top plate.....	Common iron.....	Half oval.....	1 $\frac{1}{4}$ x 2 $\frac{1}{2}$ inches.
Futchel stays, ends.....	Ulster iron.....	Round.....	3 $\frac{1}{4}$ inch.
Spring bearings.....	Ulster iron.....		1 $\frac{3}{4}$ x 3 $\frac{3}{8}$ inches.
Length.....		Half oval.....	6 inches.
Top bed, top plate.....	Norway iron.....	Half oval.....	1 $\frac{3}{8}$ x 2 $\frac{1}{2}$ inches.
Ends.....			1 $\frac{1}{2}$ x 1 $\frac{1}{8}$ inches.
Top bed, bottom plate.....	Norway iron.....	Half oval.....	1 $\frac{5}{8}$ x 1 $\frac{1}{8}$ inches.
Jaw plates.....	Band iron.....		2 $\frac{1}{2}$ inch.
King bolt.....	Norway iron.....		5 $\frac{1}{8}$ inch.
Socket arms.....	Norway iron.....	Oval.....	1 $\frac{5}{8}$ inch.
Plate portion.....			1 $\frac{1}{2}$ inch.
Ends.....		Oval.....	5 $\frac{1}{8}$ x 3 $\frac{3}{8}$ inch.
Bottom stay of futchels.....	Low Moor iron.....	Oval.....	8 $\frac{1}{8}$ x 6 $\frac{1}{8}$ inch.
Front end.....	Burden's iron.....		8 $\frac{1}{8}$ inch thick.
Back end.....	Burden's iron.....		1 $\frac{1}{2}$ x 5 $\frac{1}{8}$ inch.
Box clips.....	Norway iron.....		1 $\frac{3}{4}$ x 3 $\frac{3}{8}$ inches.
Screeing clips.....	Norway iron.....		3 $\frac{1}{4}$ x 1 $\frac{1}{8}$ inches.
Ends.....			1 $\frac{1}{2}$ inch.
Clip yokes.....	Burden's iron.....		7 $\frac{1}{8}$ x 1 $\frac{1}{8}$ inch.
Pole hook.....	Norway iron.....		3 $\frac{1}{8}$ inch.
Pole stop.....	Common iron.....		1 $\frac{1}{2}$ inch.
Pole bridge.....	Burden's iron.....		1 $\frac{3}{4}$ x 1 $\frac{1}{4}$ inches.
Evener bar plate.....	Norway iron.....		7 $\frac{1}{8}$ inch thick.
Bolt.....			5 $\frac{1}{8}$ inch.
Bottom plate.....	Band iron.....		7 $\frac{1}{8}$ inch.
Toe-board plate-drag, front.....	Burden's iron.....	Half oval.....	1 $\frac{1}{2}$ x 3 $\frac{3}{8}$ inches.
Step for boot.....	Sheet iron.....		No. 10.
Pad.....		Square.....	5 $\frac{1}{2}$ x 2 $\frac{1}{2}$ inches.
Step for body.....	Sheet iron.....		No. 10.
Pad.....		Horse shoe.....	7 $\frac{1}{8}$ inches.
Shank.....	Burden's iron.....	Octagon and round.....	7 $\frac{1}{8}$ inch.
Cover.....	Sheet iron.....		No. 14.
Shank.....			5 $\frac{1}{2}$ x 1 $\frac{1}{2}$ inch.
Bolts.....	Norway iron.....		9 x 10 inches.
If book step.....			3 $\frac{1}{8}$ inch.
Bolts.....			1 $\frac{1}{2}$ x 8 $\frac{1}{8}$ inches.
Front stay.....	Norway iron.....	Oval.....	7 $\frac{1}{8}$ x 3 $\frac{3}{8}$ inch.
Bottom stump joints.....	Norway iron.....		7 $\frac{1}{8}$ x 3 $\frac{3}{8}$ inch.
Piece part.....	Low Moor iron.....	Oval.....	7 $\frac{1}{8}$ x 2 $\frac{1}{2}$ inch.
Top stump joint.....	Norway iron.....		3 $\frac{1}{4}$ x 5 $\frac{1}{8}$ inch.
Piece part.....	Low Moor iron.....	Oval.....	3 $\frac{1}{4}$ x 1 $\frac{1}{8}$ inch.
Tire.....	Steel.....		1 $\frac{1}{4}$ x 1 $\frac{1}{8}$ inches.
Tire.....	Compound iron.....		1 $\frac{3}{8}$ x 3 $\frac{3}{8}$ inches.
Tire.....	Low Moor iron.....		1 $\frac{3}{8}$ x 1 $\frac{1}{8}$ inches.
Bolts.....	Norway iron.....	Tire.....	1 $\frac{1}{4}$ inch.
Hnb Bands, thick.....	Fall River iron.....		5 $\frac{1}{8}$ inch.
Back bands, thick.....	Fall River iron.....		1 $\frac{1}{8}$ inch.
Rocker plates, neck portion.....	L. W.....		3 $\frac{1}{2}$ x 1 $\frac{1}{8}$ inches.
Ends.....	L. W.....		3 $\frac{1}{2}$ x 2 $\frac{1}{2}$ inches.
For angular body, center.....	L. W.....		4 $\frac{1}{2}$ x 2 inches.
Ends.....	L. W.....		4 $\frac{1}{2}$ x 3 $\frac{1}{8}$ inches.
Screws.....			No. 20.
Seat rails.....	Burden's iron.....	Round.....	1 $\frac{1}{2}$ inch.
Front wings, inside bars.....	Low Moor iron.....	Oval.....	3 $\frac{1}{4}$ x 1 $\frac{1}{8}$ inch.
Outer and center bars.....	Pittsburgh iron.....	Oval.....	3 $\frac{1}{4}$ x 3 $\frac{3}{8}$ inch.
Bow wings, inside bars.....	Low Moor iron.....	Oval.....	3 $\frac{1}{4}$ x 3 $\frac{3}{8}$ inch.
Inside bars.....	Pittsburgh iron.....	Oval.....	3 $\frac{1}{4}$ x 1 $\frac{1}{8}$ inch.
Lamp prop.....	Norway iron.....	Round.....	5 $\frac{1}{8}$ inch.
Stay jacks.....	Burden's iron.....		1 $\frac{3}{4}$ x 3 $\frac{3}{8}$ inch.
Ears.....	Norway iron.....		
Back spring bearings.....	Burden's iron.....		1 $\frac{3}{4}$ x 3 $\frac{3}{8}$ inches.
Length.....			7 inches.
Back portion.....		Half oval.....	1 $\frac{3}{8}$ x 3 $\frac{3}{8}$ inches.
Back loops.....	Burden's iron.....	Square.....	1 $\frac{3}{8}$ inches.
Front end.....		Half oval.....	
Back end.....		Oval.....	1 $\frac{1}{4}$ x 1 inches.
Strap bolt.....	Norway iron.....		3 $\frac{1}{8}$ inch.

# No. 18.

**Table of Kinds and Sizes of Iron Used in Constructing a Coach, Hung upon Platform Springs;**  
**Track, 4 feet 10 inches;**

Sectional Parts.	Metal.	Shape.	Size.
Axles	Case hardened iron	Mail or Collinge	1 $\frac{1}{2}$ x8 $\frac{1}{2}$ inches.
Piece part	Low Moor iron		1 $\frac{5}{8}$ inch.
Springs			6 plates.
Front			40 inches.
Length			11 $\frac{1}{2}$ inches.
Open			No. 2.
Main and second plates			No. 3.
Third and fourth plates			No. 4.
Fifth and sixth plates			5 plates.
Back			40 inches.
Length			10 $\frac{1}{2}$ inches.
Open			No. 2.
Main and second plates			No. 3.
Third and fourth plates			No. 4.
Fifth plate			5 plates.
Cross spring			4 $\frac{1}{2}$ inches.
Arch			No. 2.
Main, second and third plates			No. 3.
Other plates			No. 4.
Front wheel	Low Moor iron	Half circle	1 $\frac{3}{4}$ x $\frac{3}{4}$ inch.
Bottom bed, bottom plate	Burden's iron	Full half oval	1 $\frac{3}{4}$ x $\frac{3}{4}$ inch.
Bottom bed, top plate	Burden's iron		1 $\frac{1}{4}$ x $\frac{3}{8}$ inch.
Side stays at spring bearings			1 $\frac{3}{4}$ x $\frac{3}{8}$ inch.
Front of bearing	Burden's iron	Round	7 $\frac{1}{2}$ inch.
Front end	Burden's iron	Round	5 $\frac{1}{2}$ inch.
Back end	Burden's iron	Round	7 $\frac{1}{2}$ inch.
Front at futchel	Norway iron	Square	1 $\frac{1}{4}$ inch.
Center of bottom plate	Burden's iron		1 $\frac{1}{4}$ inch.
Inside plate of futchels	Band iron		1 $\frac{1}{2}$ inch.
Top bed, bottom plate	Norway iron	Full half oval	1 $\frac{1}{2}$ x $\frac{3}{4}$ inch.
Top bed, top plate	Norway iron		1 $\frac{1}{4}$ x $\frac{3}{8}$ inch.
King bolt socket	Norway iron	Swaged oval	1 $\frac{1}{4}$ x $\frac{3}{8}$ inch.
Arms			1 $\frac{1}{2}$ x $\frac{1}{2}$ inch.
Ends at futchel			7 $\frac{1}{2}$ inch.
King bolt	Norway iron		1 $\frac{3}{4}$ x $\frac{3}{8}$ inch.
Pole bridge	Ulster iron	Half oval	1 $\frac{1}{4}$ x $\frac{3}{8}$ inch.
Bottom plate to puncheons	Ulster iron		7 $\frac{1}{2}$ inch.
Bottom plate for draw bar	Band iron		7 $\frac{1}{2}$ inch.
Top plate of draw bar	Ulster iron		2 $\frac{1}{2}$ inch thick.
King bolt plate of draw bar	Ulster iron		5 $\frac{1}{2}$ inch.
Axle, box clips	Norway iron		1 $\frac{3}{4}$ x $\frac{1}{2}$ inch.
Small clips	Burden's iron		3 $\frac{1}{2}$ x $\frac{3}{8}$ inch.
Bolt ends			7 $\frac{1}{2}$ inch.
Clip bars	L. W. iron	Swaged half oval	1 $\frac{3}{4}$ x $\frac{3}{8}$ inch.
Supporting bars to cross springs	Ulster iron		6 inches long.
Spring bearing			1 $\frac{1}{2}$ x $\frac{1}{2}$ inch.
Tees	Norway iron	Full half oval	1 $\frac{1}{2}$ x $\frac{1}{2}$ inch.
Clip	Low Moor iron		7 $\frac{1}{2}$ x $\frac{3}{8}$ inch.
Back bar, front carriage	Ulster iron	Oval	1 $\frac{1}{2}$ x $\frac{3}{4}$ inch.
Tees			1 $\frac{1}{4}$ x $\frac{3}{8}$ inch.
Front stay	Norway iron	Oval	1 $\frac{3}{8}$ x $\frac{7}{8}$ inch.
Brake plates	Burden's iron	Deep half round	1 $\frac{3}{4}$ x $\frac{3}{8}$ inch.
Spring bearing			6 inches long.
Book step			10x10 inches.
Backs	Sheet iron		No. 14.
Frames	Ulster iron		1 $\frac{1}{4}$ x $\frac{3}{8}$ inch.
Front	Sheet iron		No. 12.
Step work		Round	7 $\frac{1}{2}$ inch.
Joints		Square	7 $\frac{1}{2}$ inch.
Horseshoe steps			7 $\frac{1}{2}$ x8 $\frac{1}{2}$ inch.
Pad	Sheet iron		No. 10.
Shank	Burden's iron	Octagon and round	1 inch.
Step cover	Sheet iron		No. 14.
Shank	Ulster iron	Octagon and round	5 $\frac{1}{2}$ inch.
Tire	Compound iron		1 $\frac{1}{2}$ x $\frac{3}{8}$ inch.
Tire	Steel		1 $\frac{3}{8}$ x $\frac{3}{8}$ inch.
Bolts	Norway iron	Tire	1 $\frac{1}{4}$ inch.
Hub bands, front	Band iron		7 $\frac{1}{2}$ inch thick.
Back	Norway iron		1 $\frac{1}{4}$ x $\frac{3}{8}$ inch.
Rocker plates, circular body	L. W. iron	Bar	3 $\frac{1}{2}$ x $\frac{1}{2}$ inch.
Angular body			4 $\frac{1}{2}$ x $\frac{1}{2}$ inch.
Screws			No. 20.
Top joints	Norway iron	Stump joints	1 $\frac{1}{8}$ x $\frac{3}{4}$ inch.
Piece part	Burden's iron	Oval	1 $\frac{5}{8}$ inch.
Top props			1 $\frac{1}{4}$ inch.
Hinges for center of top	Norway iron		1 $\frac{1}{4}$ inch.
Weather plate	Band iron		2 $\frac{1}{4}$ x $\frac{1}{4}$ inch.
Stays		Round	3 $\frac{1}{2}$ inch.
Seat rail	Ulster iron	Round	1 $\frac{1}{2}$ inch.
Drag front plate	Burden's iron	Half oval	1 $\frac{1}{2}$ x $\frac{5}{8}$ inch.
Lamp props	Ulster iron	Taper	3 $\frac{1}{2}$ x $\frac{5}{8}$ inch.
Boot steps	Sheet iron		No. 10.
Pads			6x6 $\frac{1}{2}$ inches.
Front wing bars		Oval	3 $\frac{1}{2}$ x $\frac{3}{8}$ inch.
Bolts for securing irons to body	Norway iron		7 $\frac{1}{2}$ inch.
Bolt for securing body to carriage	Norway iron		7 $\frac{1}{2}$ inch.

# No. 19.

**Table of Kinds and Sizes of Iron Used for a Carravall or Cheap Bockaway; Perch Carriage; Two Elliptic Springs, 4 Feet 8 Inch or 4 Feet 10 Inch Track.**

Sectional Parts.	Metal.	Shape.	Size.
Axles, long stock.	Case hardened iron.	Plain taper nnt.	11 $\frac{1}{2}$ x 7 inches.
Front.			1 $\frac{3}{4}$ inches.
Length.			5 plates.
Open.			38 inches.
Main, second and third plates.			9 $\frac{1}{2}$ inches.
Fourth plate.			No. 2.
Fifth plate.			No. 3.
Back.			No. 4.
Length.			6 plates.
Open.			40 inches.
Main, second and third plates.			10 inches.
Fourth and fifth plates.			No. 2.
Sixth plate.			No. 3.
Bolts for securing front spring.	Norway iron.		No. 4.
For back spring.	Norway iron.		$\frac{7}{8}$ inch.
Fifth wheel.	Malleable iron.	Half round.	$\frac{3}{4}$ inch.
Plates.			16 inches.
Clips.			1 $\frac{1}{2}$ inches.
Ends.			$\frac{3}{8}$ inch wide.
King bolt.	Norway iron.	Plain.	$\frac{5}{8}$ inch.
Stay, strap portion.	Common iron.	Flat.	5 $\frac{1}{2}$ x $\frac{1}{4}$ inch.
End.			$\frac{3}{8}$ inch.
Head plate.	Ulster iron.		1 $\frac{1}{2}$ x $\frac{3}{8}$ inches.
At fifth wheel hearing.			$\frac{1}{8}$ inch thick.
Perch plate.	Common iron.	Swaged.	1 $\frac{3}{4}$ x $\frac{1}{4}$ inches.
Ends.	Refined iron.		$\frac{3}{8}$ inch.
Bolts.	Norway iron.		$\frac{5}{8}$ inch.
Top plate.	Norway iron.	Half oval.	1 $\frac{1}{4}$ x $\frac{1}{4}$ inches.
Side stays, outside.	Refined iron.	Oval.	3 $\frac{1}{2}$ x $\frac{1}{4}$ inch.
Inner branches.		Oval.	5 $\frac{1}{2}$ x $\frac{3}{8}$ inches.
Heels.			7 $\frac{1}{2}$ x $\frac{1}{4}$ inch.
At head block.		Half oval.	1 $\frac{1}{4}$ x $\frac{1}{4}$ inches.
Clips, strap portion.	Norway iron.		1 $\frac{1}{4}$ inches wide.
Ends.			$\frac{3}{8}$ inch.
Jack clips.	Norway iron.	Plain pattern.	1 $\frac{1}{2}$ inches.
Ends.			$\frac{1}{8}$ inch.
Bolt.	Norway iron.		$\frac{1}{2}$ inch.
Shaft iron, heads.	Refined iron.		
Strap.	Refined iron.	Swaged half round.	1 $\frac{3}{4}$ x $\frac{3}{8}$ inches.
Length on the bar.			13 inches.
Bolts.			3 inches.
Length front of bar.			18 inches.
Bolts.			4 $\frac{1}{2}$ x $\frac{1}{8}$ inch.
Pole plate.	Norway iron.	Half oval.	1 $\frac{1}{4}$ x $\frac{1}{4}$ inches.
Top plate.	Refined iron.	Half oval.	1 $\frac{1}{4}$ x $\frac{1}{4}$ inches.
Stays, outer portion.	Refined iron.	Oval.	3 $\frac{1}{2}$ x $\frac{3}{8}$ inch.
Inner branches.		Oval.	5 $\frac{1}{2}$ x $\frac{3}{8}$ inches.
Neck at end.			$\frac{3}{4}$ inch.
At head.			$\frac{5}{8}$ inch.
King holt stay.	Norway iron.		$\frac{5}{8}$ inch thick.
Neck portion.			3 $\frac{1}{2}$ x $\frac{1}{4}$ inch.
Tire.	Compound iron.	Oval.	1 $\frac{1}{4}$ x $\frac{3}{8}$ inches.
Bolts.		Tire.	$\frac{1}{4}$ inch.
Back bands of limhs.	Band iron.		No. 10.
Front bands.	Malleable iron.		
Dash.	Ordinary iron.	Oval.	2 $\frac{1}{2}$ x $\frac{5}{8}$ inch.
Rail.	Ordinary iron.	Round.	$\frac{3}{8}$ inch.
Lamp props.	Norway iron.	Round.	$\frac{5}{8}$ inch.
At head.		Round.	$\frac{1}{2}$ inch.
Seat rails.	Ulster iron.	Round.	$\frac{1}{2}$ inch.
Arms.		Round.	$\frac{3}{8}$ inch.
Heels.	Norway iron.	Tire.	$\frac{1}{8}$ inch.
Bolts.	Refined iron.	Oval.	5 $\frac{1}{2}$ x $\frac{3}{8}$ inch.
Lazy back stay.			No. 14.
Screws.			
Step.	Sheet iron.	Ohlong.	No. 10.
Pad bottom.			6 $\frac{1}{2}$ x 8 inches.
Top.			5 $\frac{1}{2}$ x 6 $\frac{1}{2}$ inches.
Main shank.	Refined iron.	Round.	$\frac{3}{4}$ inch.
At pad.			$\frac{5}{8}$ inch.
Top shank.			$\frac{5}{8}$ inch.
At pad.			$\frac{5}{8}$ inch.
Stays.		Oval.	3 $\frac{1}{2}$ x $\frac{1}{4}$ inch.
Bolts.	Norway iron.		$\frac{3}{8}$ inch.
Front step.	Sheet iron.		No. 10.
Pad.		Ohlong.	5 $\frac{1}{2}$ x 6 inches.
Shank.	Refined iron.	Round.	$\frac{5}{8}$ inch.
At pad.		Round.	$\frac{1}{2}$ inch.
Side branchees.	Norway iron.	Oval.	5 $\frac{1}{2}$ x $\frac{3}{8}$ inch.
Body loops.	Burden's iron.		1 inch.
At hnt.		Oval.	1 $\frac{1}{4}$ x $\frac{1}{4}$ inch.
At head.		Oval.	7 $\frac{1}{2}$ x $\frac{5}{8}$ inch.
Strap part.		Tapered.	11 $\frac{1}{2}$ x $\frac{3}{4}$ inches.
Center.	Ordinary iron.	Half oval.	1 $\frac{1}{4}$ x $\frac{1}{4}$ inches.
Bolts at ends.	Norway iron.		$\frac{3}{4}$ inch.
At center.			$\frac{5}{8}$ inch.
Rocker plates, straight.	Refined iron.		2 $\frac{1}{2}$ x $\frac{3}{8}$ inches.
Curved.	Refined iron.		2 $\frac{1}{2}$ x $\frac{1}{2}$ inches.
Screws.			No. 16.

# No. 20.

Table of Kinds and Sizes of Iron Used in Constructing a "Democratic" Wagon, Single Perch, on Two Springs. Track, 4 Feet 8 Inches.

Sectional Parts.	Metal.	Shape.	Size.
Axles, nut.	Case hardened	Plain taper	1 <sup>1</sup> / <sub>8</sub> x 7 inches.
Piece part, back	Burden's iron		1 x 1 <sup>1</sup> / <sub>2</sub> inches.
Piece part, front	Burden's iron		1 x 1 <sup>5</sup> / <sub>8</sub> inches.
Springs			1 <sup>1</sup> / <sub>2</sub> inches.
Front			5 plates.
Length			36 inches.
Open			8 inches.
Main plate			No. 2.
Second plate			No. 3.
Additional plates	Swedes steel.	Oval ends, button heads, full elliptic.	No. 4.
Back			5 plates.
Length			38 inches.
Open			10 inches.
Main and second plates			No. 2.
Additional plates			No. 3.
Fifth wheel	Norway iron	Half circle	15 inches.
Plates		Half round	1 <sup>1</sup> / <sub>8</sub> inches.
Bolts	Norway iron		1 <sup>1</sup> / <sub>6</sub> inch.
Perch plate, ends	Norway iron		3 <sup>1</sup> / <sub>8</sub> x 1 <sup>3</sup> / <sub>8</sub> inches.
Center	Common bar iron		3 <sup>1</sup> / <sub>8</sub> x 1 <sup>3</sup> / <sub>8</sub> inches.
Bolts	Norway iron		1 <sup>1</sup> / <sub>6</sub> inch.
Head plate	Norway iron		2 <sup>1</sup> / <sub>8</sub> x 1 <sup>1</sup> / <sub>2</sub> inches.
Top plate	Burden's iron	Half oval	1 <sup>1</sup> / <sub>4</sub> x 1 <sup>1</sup> / <sub>8</sub> inches.
Side stays, main	Burden's iron	Oval	1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>8</sub> inch.
Inner	Burden's iron	Oval	3 <sup>1</sup> / <sub>8</sub> x 5 <sup>1</sup> / <sub>8</sub> inch.
Ends of main stay	Norway iron	Half oval	1 <sup>1</sup> / <sub>4</sub> x 3 <sup>1</sup> / <sub>8</sub> inches.
Bolts	Norway iron		1 <sup>1</sup> / <sub>8</sub> inch.
Clip king bolt, strap	Norway iron		1 <sup>1</sup> / <sub>8</sub> inches.
Bolt part			3 <sup>1</sup> / <sub>4</sub> inch.
Clips	Norway iron	Plain strap	1 <sup>1</sup> / <sub>8</sub> inches.
Bolts part			1 <sup>1</sup> / <sub>6</sub> inch.
Shaft irons	Burden's iron	Swaged	1 <sup>1</sup> / <sub>4</sub> x 5 <sup>1</sup> / <sub>8</sub> inches.
Length front of bar			16 inches.
Front on bar			12 inch.
Bolts	Norway iron		1 <sup>1</sup> / <sub>4</sub> inch.
Jacks/Clips	Norway iron	Bolt pattern	
Strap			1 <sup>3</sup> / <sub>8</sub> inch.
Bolt end			7 <sup>1</sup> / <sub>8</sub> inch.
Heads, length			1 <sup>1</sup> / <sub>2</sub> inches.
Bolt			1 <sup>1</sup> / <sub>2</sub> inch.
Pole, bottom plate	Burden's iron	Half oval	1 <sup>1</sup> / <sub>8</sub> x 3 <sup>1</sup> / <sub>4</sub> inches.
Top plate	Norway iron		1 <sup>1</sup> / <sub>2</sub> x 1 <sup>1</sup> / <sub>2</sub> inches.
Main stay	Burden's iron	Oval	1 <sup>1</sup> / <sub>2</sub> x 5 <sup>1</sup> / <sub>8</sub> inch.
Inner stay	Burden's iron	Oval	3 <sup>1</sup> / <sub>8</sub> x 5 <sup>1</sup> / <sub>8</sub> inch.
Neck, at pole bar			1 <sup>1</sup> / <sub>8</sub> inch.
At head			1 <sup>1</sup> / <sub>8</sub> inch.
Whiffletree bolt	Norway iron		1 <sup>1</sup> / <sub>8</sub> inch.
T bolts	Norway iron		3 <sup>1</sup> / <sub>8</sub> inch.
Body loops, back	Burden's iron	Swaged	3 <sup>1</sup> / <sub>8</sub> x 1 <sup>1</sup> / <sub>8</sub> inches.
Heads			1 inch.
Bolts	Norway iron	Round	3 <sup>1</sup> / <sub>8</sub> inch.
Spring bar bolts	Norway iron		3 <sup>1</sup> / <sub>8</sub> inch.
Tire	Steel		1 <sup>1</sup> / <sub>8</sub> inch.
Tire	Compound iron		1 <sup>1</sup> / <sub>4</sub> x 1 <sup>1</sup> / <sub>4</sub> inches.
Tire	Common iron		1 <sup>1</sup> / <sub>6</sub> x 1 <sup>1</sup> / <sub>4</sub> inches.
Bolts	Norway iron		1 <sup>1</sup> / <sub>6</sub> inch.
Step	Norway iron	Square	
Pad			6 x 8 1 <sup>1</sup> / <sub>2</sub> inches.
Shank	Burden's iron	Square and octagon	7 <sup>1</sup> / <sub>8</sub> inch.
At pad		Oval	1 <sup>1</sup> / <sub>8</sub> x 3 <sup>1</sup> / <sub>4</sub> inch.
Back stay	Burden's iron	Round	5 <sup>1</sup> / <sub>8</sub> inch.
Bolts	Norway iron		3 <sup>1</sup> / <sub>8</sub> inch.
Dash, height			15 inches.
Bars	Common iron	Oval	1 <sup>1</sup> / <sub>2</sub> x 3 <sup>1</sup> / <sub>4</sub> inches.
Hub bands	Band iron		1 <sup>1</sup> / <sub>8</sub> inch thick.
Side rails to seat	Burden's iron	Round	7 <sup>1</sup> / <sub>8</sub> inch.

## REPAIRING CASTINGS.

Small holes in castings can be filled with a mixed metal compound, of 2 parts antimony and 1 part bismuth, this metal will expand in cooling and make a perfect filling.

## BLOCKING AN ANVIL.

It is important that the anvil be attached securely to the block, particularly where large irons are to be forged and bent; one of the simplest of the secure methods is to pass two flat bars through the block about six inches from the top, the centers of which, about one-half an inch wider apart than the length of the base of the anvil. Punch holes and cut in the threads before putting the bars in place, the holes being spaced to the width of the base, bore holes through the wood for bolts, then make plates that will clasp the corners of the base and pass bolts through these to the holes in the bars and run the bolts down tight; the underside of the corner irons should be cut away so as to have a bearing on the wood only on the extreme outside edge.

# No. 21.

## Tables of Kinds and Sizes of Iron Used in Constructing a 4 Seat Extension Top Pharton.

Sectional Parts.	Metal.	Shape.	Size.
Axles, mail or nut	Case hardened	Plain taper	$1\frac{1}{8} \times 7$ inches.
Piece part	Low Moor iron	Octagon and round	$1\frac{1}{8}$ inches.
Length	Swedes steel, oil temper.	Full elliptic; button heads; oval points.	$3\frac{7}{8}$ inches.
Open			10 inches.
Main and second plates			No. 2.
Additional plates			No. 3.
Fifth wheel	Norway iron	Flat	$1\frac{3}{8} \times 3\frac{3}{8}$ inches.
Bottom bed plate	Burden's iron		$1\frac{1}{2} \times 2\frac{1}{8}$ inch.
Spring bearing at futchel stay	Burden's iron	Flat	$1\frac{1}{2} \times 2\frac{1}{8}$ inch.
Futchel side stays	Burden's iron	Round	$5\frac{1}{8}$ inch.
Front ends	Norway iron		
Arch plate, center	Burden's iron	Square	$7\frac{1}{8}$ inch.
Front end.	Norway iron		$\frac{1}{4}$ inch thick.
Jaw plates	Band iron		$1\frac{3}{4} \times 1\frac{1}{8}$ inch.
Pole bridge	Steel		$1\frac{1}{2} \times 2\frac{1}{4}$ inch.
King bolt	Norway iron	Socket pattern	$5\frac{1}{8}$ inch.
Top plate for top bed	Burden's iron	Half oval	$\frac{1}{8}$ inch thick.
Evener bar bolt	Norway iron		$\frac{1}{8}$ inch.
Bolt plates	Burden's iron		$\frac{3}{8}$ inch thick.
Bottom plate of evener	Band iron		$\frac{1}{8}$ inch thick.
Screws			$\frac{3}{4}$ inch No. 10
Brake plates	Burden's iron	Swaged	$\frac{5}{8}$ inch thick.
Bottom plates	Common iron	Swaged	$1\frac{1}{2} \times 2\frac{1}{4}$ inch.
Tire	Steel		$1\frac{1}{8} \times 1\frac{1}{8}$ inch.
Tire	Compound iron		$1\frac{1}{8} \times 2\frac{1}{4}$ inch.
Tire	Common iron		$1\frac{1}{8} \times 1\frac{1}{8}$ inch.
Bolts	Norway iron	Tire	$\frac{1}{4}$ inch.
Hnb bands	Band iron		$\frac{1}{8}$ inch thick.
Dash	Low Moor iron	Oval	$1\frac{5}{8}$ inches high.
Bars	Norway iron		$5\frac{1}{8} \times 3\frac{3}{8}$ inch.
Heels	Norway iron		
Axle and box clips	Norway iron		$1\frac{1}{2} \times 3\frac{3}{8}$ inch.
Securing clips	Norway iron		$5\frac{1}{8} \times 3\frac{3}{8}$ inch.
Step pads	Sheet iron		
Top step pad			$5\frac{1}{2} \times 1\frac{1}{2}$ inches.
Bottom step pad			$3\frac{1}{2} \times 2\frac{1}{8}$ inches.
Main branch	Burden's iron	Square	$\frac{1}{8}$ inch.
Lng.	Norway iron	Flat	$1\frac{1}{2} \times 3$ inch.
Upper branch	Burden's iron	Oval	$5\frac{1}{8} \times 1\frac{1}{8}$ inch.
Shifting rail		Oval	$3\frac{1}{8} \times 3\frac{3}{8}$ inch.
Side stays		Round	$3\frac{1}{8}$ inch.
Stump joints, back	Norway iron		$3\frac{1}{8} \times 2$ inch.
Piece part	Burden's iron	Oval	$5\frac{1}{8} \times 1\frac{1}{2}$ inch.
Stump joints, front	Norway iron		$3\frac{1}{8} \times 3$ inch.
Piece part	Burden's iron	Oval	$\frac{1}{4} \times 1\frac{1}{8}$ inch.
Rocker plates	L. W. iron		$2\frac{1}{8} \times 2$ inch.
Screws			No. 12.
Iron brake	Low Moor iron	Swaged	$1\frac{1}{4} \times 1\frac{1}{8}$ inch.
Step bolts	Norway iron		$\frac{3}{8}$ inch.
Front body bolts	Norway iron		$\frac{3}{8}$ inch.
Additional bolts	Norway iron		$\frac{5}{16}$ inch.

### FILES—THEIR DESIGNATIONS.

By the trade files have a variety of terms whereby they are distinguished. First there is the "cut;" this has three forms—single cut, double cut, and rasp; each has different degrees of coarseness, such as rongh, coarse, bastard, 2d cut and smooth. The coarser of the single cut are sometimes called floats; the "rongh" and "coarse" cuts are adapted to files to be used upon soft metals, the "bastard" and "2d cut" are for wood and metals, the single cut for saw teeth, etc. The double cut have two coarses of chisel cuts crossing each other; the first coarse has a horizontal obliquity with the central line of the file ranging from 35 to 55 degrees; the second cut crossing the first has a horizontal obliquity varying from 5 to 15 degrees. The double cut is applied to most files used by machinists, blacksmiths and wood-workers. The rasp cut differs entirely from the other, as each tooth is complete in itself, being cut by a single-pointed tool; their coarseness is designated the same as the single and double cut.

Most files, whether single or double cut, have their edges single cut, this cut being regulated by that of the side. "Flat files" are technically those that are oblong through the center, the size being 4 inches in length,  $\frac{1}{2}$  inch wide and  $\frac{3}{16}$  of an inch thick; 6-inch,  $\frac{3}{8}$  of an inch wide and  $\frac{1}{8}$  of an inch thick; 8-inch,  $\frac{3}{4}$  inch wide,  $\frac{3}{16}$  of an inch thick; 10-inch, 1 inch wide and  $\frac{1}{4}$  of an inch thick; 12-inch,  $1\frac{1}{8}$  inches wide and  $\frac{5}{16}$  of an inch thick; 14-inch,  $1\frac{1}{8}$  inches wide and  $\frac{11}{16}$  of an inch thick; 16-inch,  $1\frac{1}{2}$  inches wide and  $\frac{13}{16}$  of an inch thick.

Round files are circular in section and have a regular taper; they are made in lengths from 2 to 16 inches; they are generally single cut, bastard.

Half round files have one flat and one convex side. The bastard is usually double cut on both sides. The 2d cut and smooth are cut double on their flat sides, and single on the convex sides. Three square files have triangular sections; they are tapered to a point, and cut double (excepting saw files); sizes range from 10 to 14 inches; usually bastard, or 2d cut.

## No. 22.

Table of Kinds and Sizes of Iron Used in Constructing a Six-seat Phaeton on Platform Springs, 4 Feet 10 Track.

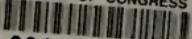
Sectional Parts.	Metal.	Shape.	Size.
Axles.....	Case hardened iron.	Mail or nut.	11 $\frac{1}{4}$ x 7 $\frac{1}{2}$ inches.
Piece part.....	Low Moor iron.....	Octagon and round.....	1 $\frac{1}{4}$ inches.
Springs.....			1 $\frac{3}{4}$ inches.
Front.....			5 plates.
Length.....			37 inches.
Open.....			11 inches.
Main and second plates.....	Swedes steel, oil temper.	Elliptic; French heads; top plates	No. 2.
Additional plates.....		spur points, bottom	No. 3.
Back.....		plates round points,	5 plates.
Length.....			39 inches.
Open.....			9 $\frac{1}{2}$ inches.
Main plates.....			No. 2.
Second plates.....			No. 3.
Fourth and fifth plates.....			No. 5.
Fifth wheel.....	Norway iron.....	Half circle.....	1 $\frac{3}{4}$ x 5 inches.
Top section molding.....		Half round.....	5 $\frac{1}{4}$ inch.
Bottom bed plate.....	Burden's iron.....	Swaged.....	1 $\frac{3}{4}$ x 3 $\frac{1}{4}$ inches.
Spring bearing at fitched stays.....	Burden's iron.....	Flat.....	1 $\frac{3}{4}$ x 3 $\frac{1}{4}$ inches.
Fitched side stays.....	Burden's iron.....	Round.....	3 $\frac{1}{4}$ inch.
Jaw plates.....	Burden's iron.....	Band iron.....	1 $\frac{3}{4}$ x 1 $\frac{1}{8}$ inches.
Arch plate.....	Burden's iron.....	Square.....	1 inch.
Front end.....			1 $\frac{1}{2}$ inch thick.
King bolt.....	Norway iron.....	Socket pattern.....	3 $\frac{1}{4}$ inch.
Plates.....	Norway iron.....	Half oval.....	1 $\frac{1}{2}$ x 3 $\frac{1}{4}$ inches.
Plate for top bed.....	Norway iron.....	Flat.....	3 $\frac{1}{8}$ inch thick.
Evener bar plates.....	Ulster iron.....	Flat.....	1 $\frac{1}{2}$ inch thick.
Bolt.....	Norway iron.....		5 $\frac{1}{4}$ inch.
Bottom plate.....	Band iron.....		1 $\frac{1}{8}$ inch thick.
Toe board plate.....	Norway iron.....	Half oval.....	1 $\frac{1}{2}$ x 2 $\frac{1}{2}$ inch.
Brake plate.....	Burden's iron.....	Swaged.....	3 $\frac{1}{4}$ x 7 $\frac{1}{8}$ inch.
Front quarter wing.....	Burden's iron.....	Oval.....	5 $\frac{1}{2}$ x 3 $\frac{1}{4}$ inch.
Inside bars.....	Burden's iron.....	Oval.....	5 $\frac{1}{2}$ x 3 $\frac{1}{4}$ inch.
Outside bars.....	Burden's iron.....	Oval.....	5 $\frac{1}{2}$ x 3 $\frac{1}{4}$ inch.
Rail to front seat.....	Burden's iron.....	Round.....	2 $\frac{1}{2}$ inch.
Pole bridge.....	Steel.....		1 $\frac{1}{2}$ x 2 $\frac{1}{4}$ inches.
Axle clips.....	Norway iron.....	Flat.....	1 $\frac{3}{4}$ x 3 $\frac{1}{4}$ inches.
Other clips.....	Norway iron.....	Flat.....	3 $\frac{1}{4}$ x 3 $\frac{1}{4}$ inch.
Step pad top.....	Norway iron.....	Gridiron.....	7 $\frac{1}{2}$ inches.
Bottom.....	Ulster iron.....	Gridiron.....	6 $\frac{1}{2}$ x 7 inches.
Main branch.....	Ulster iron.....	Square and octagon.....	7 $\frac{1}{2}$ inches.
Small branch.....	Ulster iron.....	Octagon.....	5 $\frac{1}{4}$ inch.
Guard step pad.....	Sheet iron.....		N. 10 5 $\frac{1}{2}$ x 6 inc's.
Stump joints for bottom.....	Norway iron.....	Square.....	7 $\frac{1}{2}$ x 5 $\frac{1}{8}$ inch.
Pieced part.....	Ulster iron.....	Oval.....	3 $\frac{1}{4}$ x 2 $\frac{1}{2}$ inch.
Front joint.....	Norway iron.....	Square.....	3 $\frac{1}{4}$ x 5 $\frac{1}{8}$ inch.
Piece part.....	Ulster iron.....	Oval.....	5 $\frac{1}{2}$ x 1 $\frac{1}{2}$ inch.
Tire.....	Steel.....		1 $\frac{1}{4}$ x 4 $\frac{1}{4}$ inch.
Tire.....	Compound iron.....		1 $\frac{1}{4}$ inches.
Bolts.....	Norway iron.....	Tire.....	1 $\frac{1}{4}$ inch.
Carringe part bolts.....	Norway iron.....		3 $\frac{1}{8}$ inch.
Other bolts.....	Norway iron.....		1 $\frac{1}{4}$ inch.

### FORGES.

The blacksmith's health and success depends much upon the arrangement of his forge, light, ventilation, and the situation of tool bench and anvil all contribute to success or failure. The forge itself should be about 3 feet 8 inches long and 3 feet 6 inches wide. The coal box, running across the end 8 inches wide and 10 inches deep. The water box full length of the forge 12 by 12 inches. The top of the tuyere should be about 4 $\frac{1}{2}$  inches below the level of the forge and about 6 inches from the back. The chimney should be so arranged that it will carry off all smoke and gas. To assist to this end a funnel bonnet of sheet iron should be erected over the fire, of size sufficient to form a receptacle for any extra body of smoke and hold it until it can be carried away through the chimney. The anvil should be so placed, if possible, that the blacksmith will not be compelled to stand with his back to the fire, as that position tends to bring on kidney troubles. The best position for the anvil to a right hand forge is to have the front of the anvil on a line with the outer end, and the anvil but about two feet from the forge. The height of the forge is not an arbitrary matter, as few workmen stand in similar position, while the height of the workman has much to do with the proper height of the face of the anvil, ordinarily 2 feet 4 inches is about the right height. When a forge is located on the ground floor, it is better to cut away the flooring immediately around the anvil block, and fill the opening with dirt a little above the level of the floor than to cover the space with sheet iron. The tool bench should be placed within easy reach of the blacksmith, and high enough to obviate stooping over to get the tools; a rail should be extended around three sides of the bench for a rack for all handle tools, and boarding of the top perforated to receive the points of the anvil tools. The hot-iron bin should be placed convenient to helper and smith. When the hand bellows is used it is best to attach it to the ceiling, as it is more out of the way there than when hung low. Keep everything neat and clean, have a place for everything and everything in its place.



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